ELECTRICAL REVIEW

7th MARCH 1952

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CL • NO. 3876

Aluminium in Shipbuilding

MANUFACTURERS in the United States appear to have responded well to the advice of " defense mobilizers " to use more aluminium in order to conserve copper. The shift from copper to the lighter metal in American electrical industry is already estimated to represent a 15 per cent change " poundwise " and is predicted to be 125 per cent by midsummer. Copper is scarce, but there are also big demands for aluminium; indeed in times of rearmament, when there is a shortage of most metals, manufacturers tend to regard replacement of the conventional as alternative to rather than substitution for what has been commonplace. But tradition dies hard and it is perhaps well that it does; otherwise there must be an increased risk of over-enthusiasm forcing the employment of newer substances when they are not technically appropriate, or are inferior in performance.

The first all-aluminium marine craft, for instance, is believed to have been built more than half a century ago. The light metal was originally selected because it resisted corrosion, although its mechanical strength was poor. Alloying first tended to reverse these characteristics; then alloys of magnesium with aluminium promised to combine both properties. Nevertheless the structural uses of aluminium in shipbuilding progressed slowly. The demands of the wartime aircraft factories were so voracious that there was little surplus for other purposes. Consequent expansion of extraction, rolling and extrusion capacity (which, incidentally, largely depend upon electric heat and power) concurrently enlarged the unit size of production plant, so making available plates and bars of economic sizes for ship structures. The new liner *United States* is a striking example of what is now being done. The influence, direct and indirect, of the use of aluminium in this ship of 50,000 long tons displacement is claimed to be a weight saving of from 15 to 20 per cent. The direct increase of material first cost is of the order of £400,000 which is, however,

stated to be offset by the indirect reduction of the costs of hull and machinery. The interesting conclusion is drawn in a recent paper on the subject (which is referred to on another page) that this ship, at British prices, has cost materially less than she would have done if she had been of all-steel construction. A fuel saving amounting to 8 or 9 per cent, representing about £100,000 a year, is also expected. But informed opinion seems to be growing that aluminium structures, cost apart, will not be really attractive to shipbuilders until light-alloy component parts can be electrically welded instead of riveted as a shipyard production job. As the author of the paper referred to observes " . . . the country that invented stud welding, that built the first all-welded steel ship and that builds half the world's tonnage cannot be content to depend on others for the basic design of its tools . . ."

LIGHT ALLOYS

As is the case with steel, so also with the light alloys. Cold rolling greatly improves the physical properties of the metal being treated, so much so that the tooling or "machineability" possibilities of the metal are greatly enhanced, with the result that the field of production is very much widened, particularly in the form of pressings. There is a very close relationship between the "improved" metal and the electric power drive, because the latter affords the only means of securing the high degree of precision necessary for the speed variation of the rolls, especially in continuous cold rolling, because of the inherent qualities of electric control.

DEARER ELECTRICITY

Increases in electricity charges now being announced by the Electricity Boards will be welcomed by those economists who have been complaining that electricity is too cheap. Consumers will undoubtedly view the rises differently. Nevertheless the increases are justifiable; indeed it is remarkable that electricity prices have been kept so low so long. Materials, salaries, wages and other costs have followed the general rising trend and the position has now been reached where improved efficiency has ceased to counteract mounting expenditure. The increases are being made none too soon for the financial health of the B.E.A. and Electricity Boards.

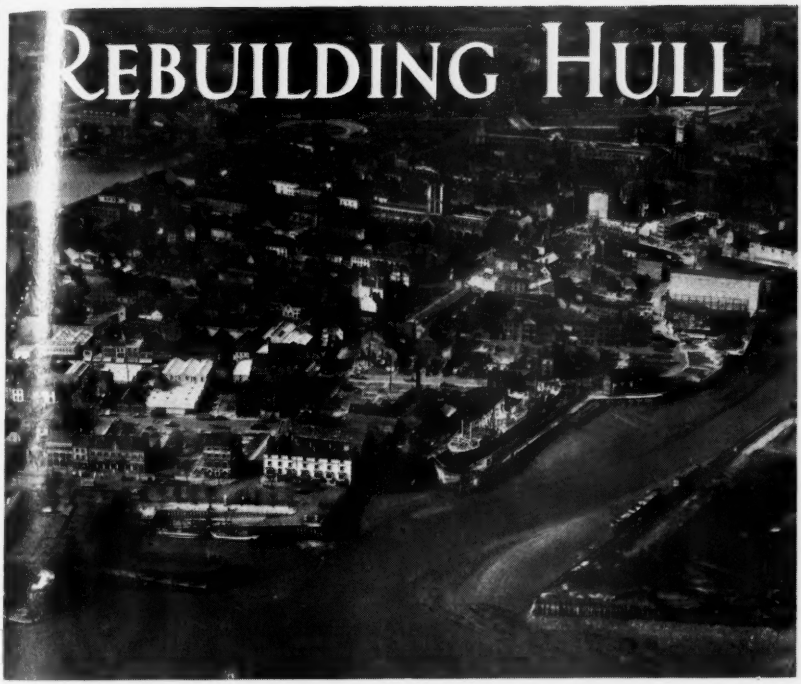
COOLING TOWERS

Rate of air flow, probably the most important of the several variable factors that enter into calculations relating to cooling tower performance, can readily be assessed for towers using mechanical draught though not for natural-draught designs. The importance of Mr. H. Chilton's "performance coefficient," discussed at a joint meeting of the Institutions of Electrical and Mechanical Engineers and reported in this issue, is that natural-draught towers are being used for nearly half of the generating capacity in the present power station construction programme of the B.E.A.—a proportion which, as the author pointed out, may well increase as suitable riverside sites become harder to find.

"WORKERS" AND "STAFF"

Between the manual workers and technical staff of the electricity supply industry there seems to be a great gulf fixed. It does happen that an "operative" occasionally ascends to the staff level but it is considered an event. It is very different in the United States where every electrical worker has a vice-president's baton in his tool kit. One of the questions which has recently occupied the attention of the supply industry's Employees' National Committee is how this gap can be jumped. The transition is more easily made in the apprentice stage; it is in the case of the more mature worker that difficulties arise.

REBUILDING HULL



Provision of Electricity for New and Reconstructed Premises

HULL or, to give it its full name, Kingston-upon-Hull, was one of the most severely bombed cities in the United Kingdom. Apart from great destruction of residential property, about 17 per cent of its 9,200 commercial and industrial establishments were destroyed or severely damaged. The rebuilding or repair of these, coupled with normal expansion, has presented the Hull Sub-Area of the Yorkshire Electricity Board (of which, until recently, Mr. D. Bellamy was manager) with a formidable task in providing electricity in the 162 sq miles of the city area. This task has been further complicated by the necessity to lay out the distribution system in relation to a comprehensive long-term scheme for the almost complete rebuilding of the city's centre.

Thanks, however, to the foresight and good planning of the Hull Electricity Department, which was responsible for the electricity supply in the area before nationalization, it is being found possible to build the new requirements on the framework of a distribution scheme which has been developed over the last twenty years.

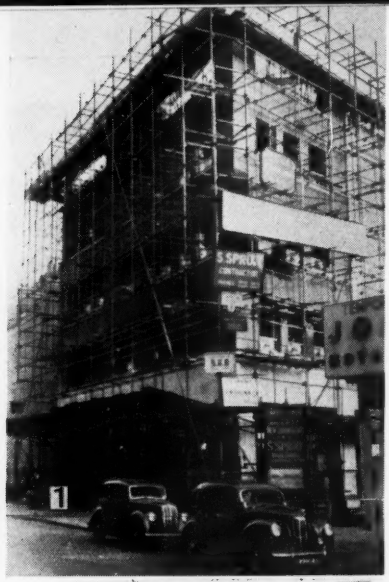
When war broke out in 1939 a 22 kV primary distribution system fed from the Sculcoates generating station had been commenced. This comprised four main 22/6·6 kV transformer substations having a total ultimate capacity of 55,000 kVA. These are situated in the industrial areas of central, east and west Hull. From these primary substations and the generating station the 6·6 kV secondary distribution

system served 283 6,600/430/240 V transformer substations (capacity 165,705 kVA) and also afforded supplies to the South-East Yorkshire Supply Co. and the Buckrose Light & Power Co.

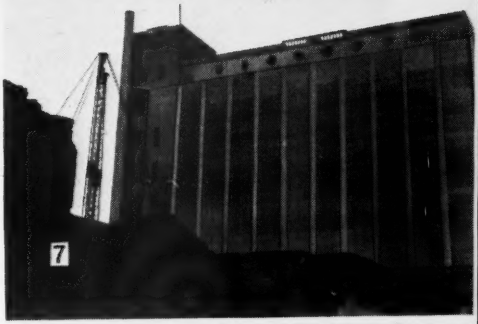
To-day, to meet new and altered demands, three additional primary substations with a total ultimate capacity of 45,000 kVA have been constructed while the Extractor substation, so named because of its proximity to the British Oil & Cake Extracting Mills, is nearing completion and will have an ultimate capacity of 15,000 kVA.

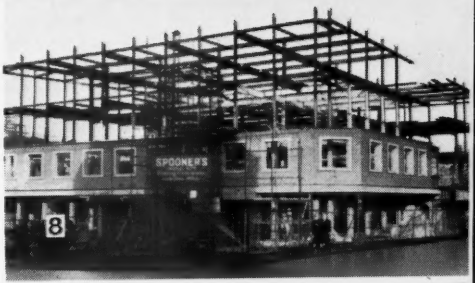
Further primary substations are planned within the next two years at Holderness High Road and Dansom Lane, the capacity in each case being 15,000 kVA. Similarly the number of secondary transformer substations has been increased until it now stands at 469 (representing a capacity of 256,833 kVA) and it is estimated that twelve substations per annum representing 6,000 kVA will be required for the next few years.

Since 1939 22 kV feeders have been extended by 61 miles to 131 miles, 6·6 kV feeders by 39 miles to 190 miles, and l.v. mains by 165 miles to 885 miles. The normal developments proposed in the next two years will involve the provision of a further 7 miles of 22 kV feeders, 6 miles of 6·6 kV distributors and 15 miles of l.v. mains. During the past twelve years the annual consumption of electricity has increased from 232 million kWh to 413 million kWh and the maximum demand from 73 MW to 123 MW. By the time the



Some of the new buildings erected or in the course of construction at Hull: (1) Jordan's cycle and motor cycle offices and showrooms, Story Street; (2) Joseph Rank's rebuilt Clarence Flour Mills; (3) W. H. Smith & Son's Festival House, Jameson Street; (4) East Hull deep drainage pumping station, Hedon Road



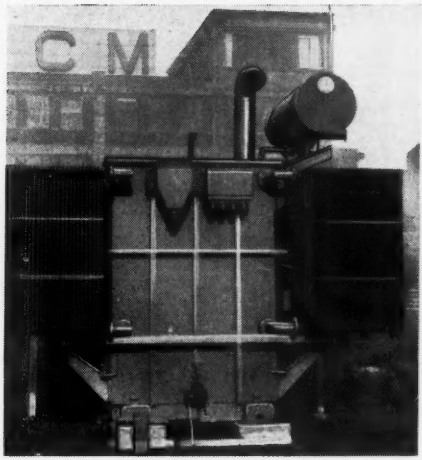


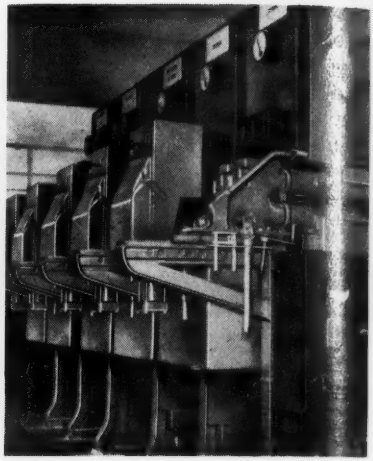
(5) Shell-Mex Building, Ferensway; (6) Reckitt & Colman's factory, showing bomb damaged remains on left and new extension in course of construction on the right; (7) Spiller's Flour Mills; (8) Edwin Davis & Co.'s general stores, Bond Street; (9) Premier Oil & Cake Mills' Isis Mills; (10) Sissons' paint and varnish works

plans now in hand are completed the additional consumption is expected to be about 30 million kWh a year and the additional maximum demand about 10 MVA.

Among the new and rebuilt factories for which new electricity supply arrangements have been or are being made are Joseph Rank's Clarence Flour Mills (2,000 kVA); Spillers' Flour Mills (1,500 kVA); Reckitt & Colman's Dansom Lane factory (500 kVA); the British Cocoa Mills (500 kVA); Sissons Bros. & Co.'s paint and varnish works (300 kVA); J. H. Fenner & Co.'s belt works (1,500 kVA); Priestman's engineering works (1,000 kVA); British Industrial Solvents' factory extension (1,500 kVA); Imperial Typewriter Co., Ltd. (300 kVA); and Smith & Nephew Associated Co., Ltd. (900 kVA).

Furthermore, additional electricity supplies are constantly being demanded for the docks: Hull is the third largest port in the country. Many large blocks of commercial and office establishments are now coming into commission including Ravenseft Properties shops and offices, King Edward Street; Edwin Davis & Co.'s general stores, Bond Street; Jordan's cycle and motor cycle stores and offices, Story Street; Hammonds' general stores, Jameson Street; the Shell-Mex Building, Ferensway; and W. H. Smith & Son's Festival House, Jameson Street. Supplies have also been given to about 6,000 houses erected since the war and will be provided for the





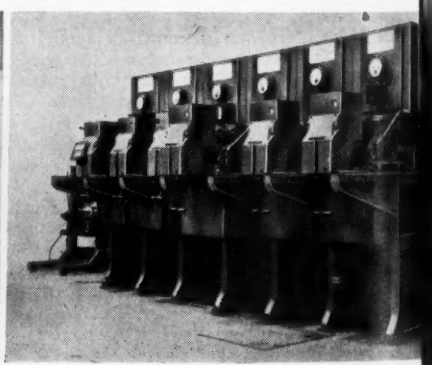
Left: **One of the 7,500 kVA, 22/6·6 kV Metrovick transformers in course of erection and** *Right:* **6·6 kV 250 MVA Reyrolle type 2C6T switchgear at the Extractor substation**

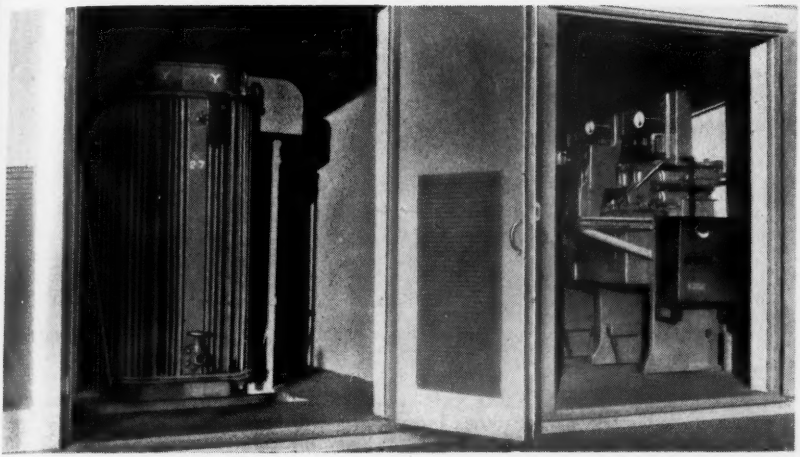
6,000 which it is planned to erect within the next five years. A £1,000,000 deep drainage scheme for east Hull also accounts for about 500 kVA.

In general, the design and equipment of the substations follow standard patterns modified to meet local conditions and requirements. One of the most important of the older primary substations is at King George V Dock, which, besides giving a 6·6 kV a.c. supply to neighbouring secondary substations, also provides 440 V d.c. supplies for dock crane and winch purposes as well as feeding the Holderness and Withernsea areas at 11 kV a.c.

The incoming 22 kV supply is controlled by Reyrolle type 2A8T gear which has a rupturing capacity of 250 MVA. Two 7,500 kVA Metrovick transformers, fitted with automatic on-load tap-changing gear, step down the supply to 6·6 kV and two 3,000 kVA 22/11 kV units provide the Holderness and Withernsea supplies. Two 500 kW motor generators and two 1,000 kW

Left: **Combined Yorkshire Electricity Board and consumer's double-tier l.v. switchboard (Metrovick) at the Isis Mills of the Premier Oil & Cake Mills.** *Right:* **6·6 kV 150 MVA Reyrolle type C5T switches at the Isis Mills**





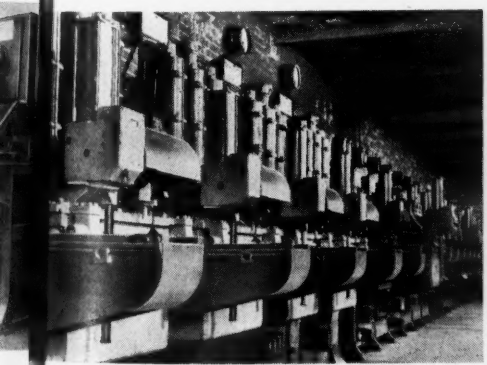
Brick-built transformer and switchgear compartments of the substation at Priestman's engineering works, Hedon Road

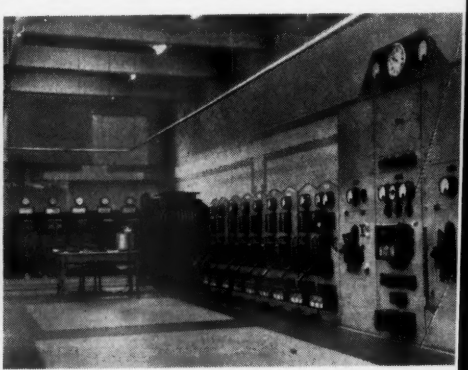
Bruce Peebles motor convertors furnish the direct current, the two larger machines being remotely controlled from the Sculcoates generating station. Reyrolle B2T switchgear (250 MVA rupturing capacity) is employed for the 6·6 kV circuits and Reyrolle type C3 gear (150 MVA rupturing capacity) for the 11 kV supplies.

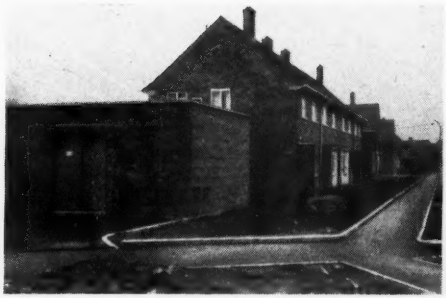
The design of the new Extractor substation, still in course of construction, is typical of that adopted for the new primary substations. It is laid out for two 7,500 kVA transformers and space is provided for reactors and two further transformers to give 433/240 V supplies to the locality. Reyrolle h.v. switchgear has again been adopted, type 2A2T (500 MVA rupturing capacity) for the 22 kV and type 2C6T (250 MVA) for the 6·6 kV supplies. The Metrovick l.v. switchgear used for the local distribution is of the compact, backless type.

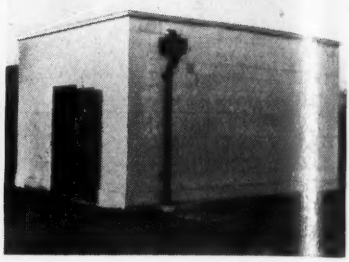
In the same vicinity, in a new flour mill which Spillers, Ltd., are erecting to replace

Left: **The 6·6 kV switchgear at King George V Dock primary substation.** *Right:* **In Reckitt & Colman's substation the Yorkshire Electricity Board has adopted a light grey colour scheme for its switchgear to harmonize with the company's l.v. gear on the right**









Left: **The Amethyst substation serving a portion of the new Bilton Grange housing estate.** *Right:* **Substation at the British Cod Liver Oil Co.'s factory extension**

a building destroyed by bombing, can be seen an up-to-date layout of a secondary substation of the type used to give a 6·6 kV supply to factory premises. Fed by a ring main, the substation is equipped with a five-panel switchboard comprising Reyrolle C6T switches of 250 MVA rupturing capacity for both the ring main feeders, the two 1,500 kVA transformers, and a section-metering panel. An automatic CO_2 fire extinguishing system is provided.

A somewhat similar type of substation is already in service at Priestman's engineering works in Hedon Road. Here the 6·6 kV ring main and the two 510 kVA 6,600/433/240 V transformers, controlled by Reyrolle C5T switches, are in brick built compartments.

In the same industrial area is a recently completed substation equipped with one 300 kVA outdoor Metropolitan-Vickers transformer (with provision for a second), Reyrolle type C5T 6·6 kV switchgear and Crompton Parkinson "Klad" low voltage gear which serves the British Cod Liver Oil Company's factory extension. Farther out of the city in the same direction another substation affording a 6·6 kV supply caters for the extensions to the British Industrial Solvents' works at Salt End.

A somewhat different arrangement for a factory substation has been adopted at the British Cocoa Mills on account of space limitations. Here the Metrovick 500 kVA transformer and the Reyrolle 6·6 kV switchgear have been housed in separate brick built compartments on the ground floor while the l.v. switchboard, which includes an English Electric OB3 800 A 25 MVA air-break main switch, is situated on the floor above. Space considerations have also led to the housing of the English Electric l.v. switchgear on the first floor in the paint and varnish works of Sissons Bros.

When the same room houses electrical equipment belonging to both the Yorkshire Electricity Board and the consumer, the Board's l.v. switchgear is arranged to line up with the consumer's own gear. A good example of this is to be found at Reckitt & Colman's new factory. The transformer equipment comprises a 500 kVA unit to give a 400 V three-phase supply and a 200 kVA transformer to give a 220 V three-phase supply.

Similar attention has been paid to uniformity at the Isis Mills of the Premier Oil & Cake Mills, Stoneferry, where a combined Y.E.B. and consumer's l.v. switchboard comprising Metrovick AIR 25 MVA air-break gear has been arranged in a double tier to operate in three sections. Facing this switchgear is the 6·6 kV board composed of Reyrolle C5T gear. The three 1,000 kVA 6,600/440/230 V Metrovick transformers are situated outside.

The Bilton Grange estate equipment comprises a 500 kVA Metrovick indoor type on-load tap-changing transformer, Reyrolle C5T 6·6 kV switchgear and a Metrovick BBO 750 A 25 MVA front connected l.v. switchboard.

P.O.A. "Minibition"

THE Purchasing Officers' Association's "Minibition" will this year again be an important feature of the National Conference at Harrogate from 2nd to 5th October. The Association at this conference will celebrate its coming-of-age.

VOLTAGE TRANSFORMERS

Special Designs for Metalclad Switchgear

By N. ASHTON, A.M.I.E.E.*

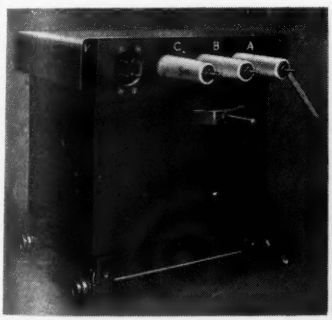
A LARGE proportion of the voltage transformers made by the manufacturing firm with which I am associated are specially designed for use with metalclad switchgear, a range having been evolved to suit the different types of this class of switchgear up to 66 kV.

Metalclad switchgear necessitates voltage transformers which can readily be isolated, which is done by withdrawing the transformer from sockets in the switchgear, the primary current being broken in air at the spring loaded contacts of the h.v. bushings. This practice is perfectly satisfactory at system voltages up to 22 kV in view of the small current to be interrupted. At 33 kV and above, however, it is considered preferable to interrupt the primary current under oil, even when the transformer is of a withdrawable type. All of this class have h.v. fuses in the primary circuit, mounted in the transformer tank under oil; they are either rewireable, in which case separate current limiting resistors are also provided, or of the high rupturing capacity cartridge type; l.v. fuses in the secondary circuits are also fitted.

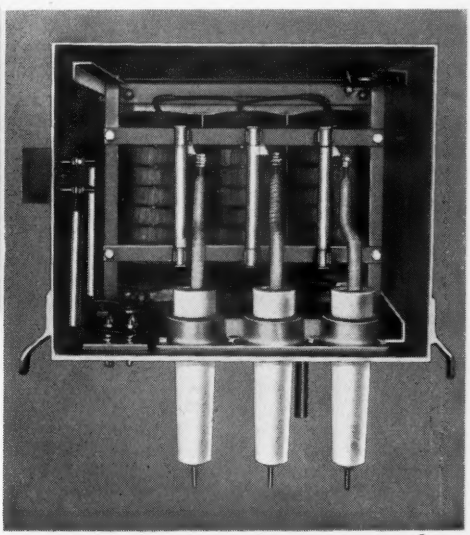
Plug-in Types

For the lower voltage classes of switchgear without phase separation a three-phase transformer is usually employed, in a steel tank with wheels on guide-rails, and it is isolated by horizontal withdrawal of the whole unit. Hinged or readily removable covers afford access to the h.v. fuses; mechanical interlocking prevents access to the interior of the tank while the transformer is in the energized position. When withdrawn (isolated position) the h.v.

*Metropolitan-Vickers Electrical Co., Ltd.



Three-phase 11 kV "plug-in" voltage transformer for KOC-type switchgear



Interior of three-phase 11 kV voltage transformer showing high rupturing capacity h.v. fuses

sockets in the stationary portion of the switchgear are automatically covered by shutters. Another safety feature of this plug-in pattern is a long plug which, during plugging in, earths the tank well before the h.v. contacts make connection and, on withdrawal, maintains the earth connection until well after the h.v. contacts have separated.

Secondary connections are also made through plug and socket contacts, so that when the transformer is withdrawn the secondary winding is isolated and there is no possibility of high voltage being induced in the primary winding by a feedback through the secondary circuit. The secondary windings are always earthed to the tank at one point. It is important to remember that an unearthed secondary winding may attain to a dangerously high potential to earth.

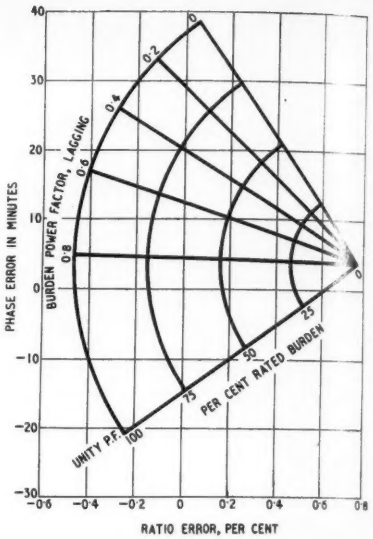
Standard three-phase transformers are of the three-limbed core construction with concentrically mounted h.v. and l.v. windings. The primaries are divided into a number of separate sections, and reinforced insulation is provided between the end turns. For up to 11 kV the primary bushings are of porcelain, while for higher voltages bonded Bakelite paper bushings of the condenser type are employed.

When a residual voltage output is needed under fault conditions for the operation of directional earth fault protection or similar purposes, the neutral point of the voltage transformer primary windings is earthed, and an additional path must be provided for the residual flux which exists under earth fault conditions. To satisfy this requirement a five-limb core is used with residual voltage windings connected in broken-delta, the secondary residual voltage appearing across the break in the delta.

Type SB Transformers

Features of the SB-type metalclad switchgear are that all bushing insulators are immersed in oil, under which all isolation takes place, and that the phases are completely separated. For this type a range of single-phase voltage transformers has been developed. They are connected between line and earth so that three units form a three-phase star/star group with earthed h.v. neutral.

Although each single-phase transformer can be lifted away from the switchgear, it



Typical performance diagram for voltage transformers

is unnecessary to do so when isolation only is required. Each unit is provided with a primary fuse supported in a movable carrier and operated by an external lever. With the latter in the "connected" position the fuse makes contact between the h.v. bushing and the primary winding, thus energizing the transformer. Moving the lever to the "disconnected" position raises the fuse out of the oil into the domed cover, where it is earthed; the primary winding is thus isolated. In this position the hinged lid, which is mechanically interlocked with the lever, can be opened to obtain access to the fuse which can be removed without immersing one's hands in oil. The interlock, however, prevents the opening of the hinged lid when the lever is in the "connected" position. The position of the lever is automatically indicated by the words "v.t. connected" or "v.t. disconnected."

These single-phase units are of core type construction with concentrically mounted primary and secondary windings on one limb of the core. The major insulation is pressboard and oil; extreme care is taken in drying out the windings and insulation, initially by circulating dry hot air and

finally under vacuum. After filling with oil the vacuum is applied again to extract any trapped air. The h.v. condenser bushings employed are of bonded Bakelite paper construction.

An advantage of using single-phase transformers of this type is that residual voltage output can readily be provided without any radical change in construction; it is only necessary to add residual voltage windings for connection in broken-delta, or to provide auxiliary voltage transformers energised from the standard secondary windings of the main voltage transformer group.

On systems where, under earth fault conditions, the voltages to earth of the "healthy" phases may rise to something approaching the rated line-to-line value, thus applying up to 1·73 times normal voltage to the primary winding, the core flux density is chosen to prevent the magnetizing current from becoming excessively great.

Ratings and Performance

Standard 6·6 kV and 11 kV voltage transformers comply with Class B accuracy (B.S.81: 1936) for a rating of 100 VA/phase, but ratings of 200 VA/phase at this accuracy can be provided. Rated outputs between 300 VA and 500 VA/phase, Class B accuracy, are available from the SB series of transformers.

In the typical performance diagram herewith, showing ratio and phase errors for burdens up to the rated value and of any power factor between unity and zero lagging, the positive signs indicate (in ratio error) that the secondary voltage is high and (in phase error) that the reversed secondary voltage leads the primary voltage.

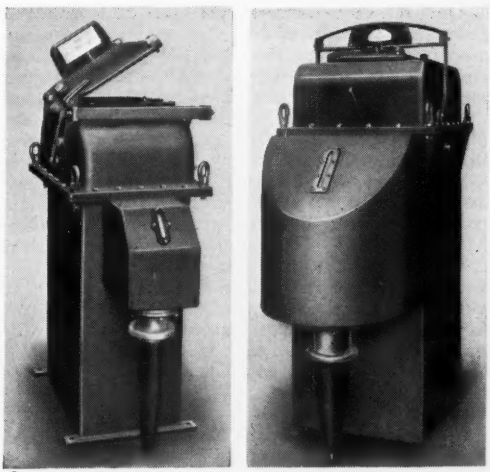
Since in actual service the errors due to voltage drop in the secondary wiring to the meters may be of the same order as, or may even exceed, the errors due to the voltage transformer itself, there is rarely any advantage in using a greater accuracy than Class B. Provided the overall errors on the working burden are known and are taken into account in the meter calibration, Class B accuracy is perfectly satisfactory even for precision bulk metering. Even if Class A voltage transformers should be employed it would still be necessary to determine the overall errors on the working burden, and the metering accuracy obtainable after the errors had been allowed for would not be perceptibly improved.

Testing and Determination of Errors

All these Metrovick transformers undergo applied voltage and induced overpotential tests as specified in B.S.81: 1936. Since the primary windings of the SB-type transformers have one end earthed, the full value for an applied voltage test has to be induced in the winding, involving interturn test voltages of approximately four times the working values. These tests are carried out by applying suitably increased voltage and frequency to the secondary winding.

Routine measurements of ratio and phase errors are made on all transformers to ensure compliance with the rated output and accuracy. Measurements of turns ratio, winding resistance, magnetizing current and core loss are also made. These do not normally concern the user, but they are valuable checks on the quality of materials and workmanship.

When the ratio and phase errors under



Left: **Single-phase 66 kV voltage transformer for SB28-type switchgear.** *Right:* **Single-phase 33 kV voltage transformer for types SB18 and SB24 switchgear**

working conditions are to be included in the calibration of meters, additional measurements of errors are made with a connected burden which simulates as closely as possible the actual burden to be used on each phase, both in magnitude and power factor. Since it is required to know the errors at the meter terminals (not at the secondary terminals of the transformer) resistors are included to represent the wiring between the transformer and the meters. Care is taken to ensure that any particular phase of the burden is connected to the same phase of the transformer as on site, and also that the phase sequence is correct.

Aluminium for Ships

Outline of Recent Developments

PRACTICAL progress made in the use of aluminium as a shipbuilding material is recorded in a paper by Mr. E. C. B. Corlett (naval architect, British Aluminium Co., Ltd.) which has been read before the North-East Coast Institution of Engineers and Shipbuilders at Newcastle-upon-Tyne and repeated at the Tees-Side branch in Middlesbrough.

Materials of the aluminium alloy types at present obtainable are first discussed together with available means of joining them, in which connection the author has some pertinent comments to make about electric welding methods and procedure.

In the second part of the paper a suggested code of practice is outlined and a new set of sections is proposed, the geometric properties of such a range being given. Scantling tables for deck houses and light superstructures are proposed and a set of such tables is put forward. While the latter are tentative, the weight ratios obtained are attractive, indicating possible savings of materials.

Details are given of the use of aluminium in the new liner *United States* which is of 50,000 long tons displacement and 990ft long overall with accommodation for a crew of 1,000 and 2,000 passengers. The weights of aluminium used in this ship are: 1,000 tons in the superstructure; 400 tons for funnels, boats, masts and davits; 600 tons for minor bulkheads, furniture, etc.; all secured with some 1·2 million aluminium rivets of large diameter.

The author concludes that aluminium has " emerged from the morass of speculation and multitudinous specifications " to become a useful shipbuilding material, the biggest disadvantage of which is a non-technical one—indeed, the author observes that it can be described as a political one—namely, the necessity of buying the majority of ingots from hard currency countries, which has been responsible for a considerable rise in the cost of the metal. It requires approximately five or six times as much energy to extract one ton of aluminium from ore as it does to extract one ton of iron from its ore. This energy must be paid for and, at the moment, this country is in the unfortunate position of having to pay for it in sterling. The building of extraction plants in the sterling area must, the author believes, be rated as one of the most important objectives in sight.

A further cause for concern to the author is Great Britain's present lag behind America in the development of equipment for welding aluminium electrically. Arc shielded sets were in very large-scale use in transatlantic industry before the first experimental equipment was produced in Britain. This state of affairs is described by the author as unnecessary and damaging to the graduation of aluminium from the incidental stage in large-scale shipbuilding to its acceptance as a principal structural material.

E.I.B.A. Surrey Branch

THE annual general meeting of the Surrey Branch of the Electrical Industries Benevolent Association will be held at the Old People's Home, Broome Park, Betchworth, Surrey, on 12th March, at 10.30 a.m., under the chairmanship of Mr. J. A. Sturgeon, managing director, Foster Electrical Supplies, Ltd. Nominations for committee, etc., should be forwarded before 10th March to the hon. branch secretary, Mr. S. Gill, 56, South Street, Dorking, Surrey.

Shortage of Engineers

American Methods of Raising Recruits

By S. E. GREENFIELD

"THE climate is beyond compare. Recreational opportunities are unlimited. Golf, fishing, the patio life at home can be yours 12 months a year and your high salary enables you to take full advantage of the climate and recreational opportunities." . . . "Housing conditions are excellent in the Los Angeles area. Elementary and high schools are conveniently located. Junior colleges and major universities abound." All, as one can guess, can be found in California. "Enjoy North Georgia's healthful year-round climate and famous scenic beauty . . . only 8 miles from Atlanta." "San Diego, with its wonderful residential areas, offers you and your family incomparable living. Ideal climate—cool, clean, dry. Mountains, desert, Mexico, Hollywood, Los Angeles, Pacific Ocean, beaches and bay—only hours or minutes away—a new life, pleasant, refreshing, happy."

These are not extracts from American travel agents' publicity blurbs, nor are they products of the fertile brain and lyrical imagination of the more enterprising house agents inviting one to escape from the rigours of a humdrum life in an industrial town. They are from advertisements for situations vacant printed in a number of current American engineering journals. The potential employees addressed so effusively are those having qualifications in aeronautics, electronics and various branches of heavy engineering.

Rearmament Effects

The explanation of this solicitude for prospective workers on the part of otherwise hard-headed employers lies in American rearmament and the consequent demands in particular of aircraft and other industries established in recent years in the California region. Because of the requirements of the armed services (as in other countries) there is an acute manpower shortage, which is likely to become aggravated, according to the U.S. Census Bureau, by the progressively smaller number of young men who will turn eighteen during the next three years. So far as engineering is concerned, not only rearmament but also increasing civilian demands are responsible for an estimate of some 70,000 to 80,000 unfilled positions. Graduates available number about 35,000 and half of them are already earmarked for national service. This year, it is thought that graduations from the universities and technical institutions will be of the order of 26,000, excluding any who may be drafted for selective service. By 1953, this number will be approximately 22,000, falling to about 17,000 in 1954 and in 1955.

Graduates and Engineering

Discussions are proceeding between university leaders, industrialists, Government officials and others in the Engineering Manpower Commission with a view to studying the best way of meeting the demand. The first essential is economy in using the services of graduates—such as the release of men from positions which do not require a strict engineering training. Another step is to draw up a programme for encouraging an increasing number of high-school graduates to take up engineering as a profession—one way at present apparently consisting in offering abnormally high starting salaries to young engineers.

One result of these high starting salaries has been a great deal of discontent among older and more experienced engineers who are subject to a salary "freeze" under the regulations of the Salary Stabilization Board. The Board recently put the general problem of salary stabilization to the Engineers' Joint Council, representing 130,000 engineers, which has suggested action on the following lines:—

> (a) Correction of salary inequities where there is a considerable disparity between starting salaries and those paid to older engineers, particularly with a view to granting

commensurate increases for qualified and well-experienced engineers.

(b) Adjustments of salary levels in areas where salaries were abnormally low at the time of the wage and salary freeze.

(c) Some flexibility in treatment of special cases.

(d) Appropriate salary increases for professional employees and others, depending on the degree of responsibility of the individuals concerned in instances where an exact grading of the work done is impracticable.

(e) Bonus payments for agreed overtime schedules.

The special emphasis on living amenities, on welfare and pension schemes as well as on the inherent technical interest of the jobs offered, is a consequence of the abnormal demands for engineers. In brief, professional engineers are in acutely "short supply" in the United States and, although it has been suggested in some quarters it is extremely doubtful if more than a few individuals from other countries could contribute to the solution of this very pressing problem.

Electricity in Southern Rhodesia

Commission's Report for 1950–51

By DOUGLAS SPENCER

THE business and services of the Electricity Supply Commission of Southern Rhodesia continue to increase. In the year ended 31st March, 1951, consumption rose to 259·7 million kWh from 217·2 million in the preceding year, a growth of 18·52 per cent. The increases were roughly 14 million kWh in the mining industry, 13 million in industrial supplies, two and a half million in supplies to farmers and 8 million in municipal supplies.

The total revenue increased from £784,462 to £951,074 or 21·24 per cent, and the profit from £46,002 to £65,318 on an average price per kWh of 0·857d as against 0·846d. Production cost was 0·818d/kWh, compared with 0·803d in 1949–50, the difference being explained mainly by the increased price of coal at the pithead: 12s instead of 10s. Coal consumption was 171,353 tons, the price per ton at the various stations being: Umtali, 29s 2d, Gwelo, 21s 7d, Umniati, 23s 6d, Gwanda, 21s 1d, and Shabani, 25s 11d. Consumption in lb/kWh generated was as follows:—Umtali, 1·71; Gwelo, 1·82; Central Umniati "A," 1·86; Umniati "B," 1·22; Gwanda, 1·66; and Shabani, 1·57.

The six stations had the following kW capacities:—Gwelo, 4,500; Umniati "A," 5,000; Umniati "B," 40,000; Gwanda, 7,500; Umtali, 6,500; and Shabani, 11,250, a total of 74,750 kW. New plant was on order for Umniati "B" (40,000 kW), Umtali (10,000 kW) and Shabani (10,000 kW). The load factors ranged from 43·06 to 62·35. Total capital expenditure up to 31st March, 1951, was £8,023,395.

Increased load has been given to the Umniati stations since early in 1951 by the construction of an 88 kV line from Gatooma to Salisbury, a distance of 87 miles, capable of delivering 12,000 kW during the evening peak load in Salisbury, which arises mainly from the general use of electricity for domestic purposes. Practically all new houses are fitted for 100 per cent use of electric power.

During the twelve months 851 miles of transmission and distribution lines were installed, and a further 168 miles were acquired from Salisbury Municipality, making the total added 996 miles, and bringing the whole system up to 4,702 miles. Many more connections are being made during the current period, as shortage of material has caused a large accumulation of unfulfilled demands, to say nothing of the heavy requirements of new industries.

Marketing Electrical Appliances

The report of the Commission contains a very interesting note on the wisdom and foresight of Umtali Municipality, where a service centre has been opened, in the financing of which the municipality and eleven merchant firms assist. These firms display electrical appliances and give demonstrations in domestic uses and of

special machinery for farms. An ever-increasing number of farms are on the grid system and shops with electrically driven tools for repair of mechanical equipment are becoming very general.

The demand for this kind of plant can be gauged by considering the distances, east to west, of the main towns in which repairs can be done. Umtali to Salisbury 167 miles, Salisbury to Hartley 74, Hartley to Gatooma 21, Gatooma to Que Que 46, Que Que to Gwelo 39, Gwelo to Bulawayo 106. Then there is the distance from the farms to the stations, in many cases 40 to 50 miles. Farm requirements are a market well worth looking into. As far as the writer knows only one British electrical concern is represented in Southern Rhodesia by its own office and staff and stocks of supplies and spares.

The growth of industries is very marked as can be judged from the increase in industrial power consumption. For some time there has been a large and ever-growing spinning mill in Gatooma, run under Government auspices, in conjunction with a cotton ginnery. There is a textile mill some seven miles north of Gatooma with an output of over 250,000 lb yearly, and another large and up-to-date mill is under construction in Hartley. The village of Norton, about 30 miles south of Salisbury, well known to the R.A.F., is being laid out as an industrial township.

Hydro-Electric Power

Notes on electrical markets in the Colony would not be complete without reference being made to the awakened interest in the damming of rivers to conserve water and produce power. Five drought years and an expenditure of many millions of pounds on buying maize has led to the collection of data on many rivers which have been carefully surveyed. The construction of dams will lead to accurate gauging and then on to power development. The district in which the possibilities of water power are most obvious is that which is known as the Eastern Border marching with Portuguese East Africa.

The developments can be speeded up by a better informed public, which could be produced by the formation of some such body as a Water Power Development Association. The nucleus of such a body exists in the "Eastern Districts Development and Publicity Association," whose secretary is Mr. E. W. Wright, in Umtali. He would, the writer is sure, gladly welcome catalogues and descriptions of plants large and small, which would help to spread knowledge of the rudiments of water power development, water gauging, etc.

Of the larger of the medium-sized developments, that on the Odzi River, reported on by Sir Alexander Gibb & Partners, is likely to be the first. But it is practically certain that the Kariba Gorge scheme will be proceeded with, even if the Kafue River scheme has to be worked out afresh.

Production Technology and Management

THE Ministry of Education has announced that, with the aim of contributing to industrial productivity in this country, 75 scholarships are to be awarded this year for the study of production technology and management in selected universities or technological institutes and industrial undertakings in the United States. The Mutual Security Agency (formerly the Economic Co-operation Administration) is to supply the dollar equivalent to meet tuition fees, travelling expenses in the United States and suitable maintenance allowances. The approximate cost will be $250,000. Return passages to the United States will be paid for from public funds.

The awards will be made in two groups. In the first group, forty awards, available for the study of management and normally tenable for a period of nine months, will be open to persons between the ages of twenty-three and thirty-five of adequate educational standard, who are potential managers or are occupying positions of responsibility in industry, or who propose to teach management subjects. A minimum of three years' industrial experience will be a condition of entry. In the second group thirty-five awards, available for the study of production technology combined with management and normally tenable for a period of one year, will be open to students who hold good honours degrees in either pure science or technology, who have had at least two years' industrial experience and who are now working in industry or research associations or are teaching in universities or technical colleges.

Successful candidates will be expected to leave for the United States early in September next. The closing dates for applications are 16th and 30th April for the technological and management awards respectively. Full details may be obtained from the Ministry of Education (F.E. Division 1), Curzon Street, W.1.

Guarding Machinery

Responsibility of Employers

By F. E. SUGDEN, A.C.I.S.

THE question of liability for injuries caused by dangerous machinery was raised in a case which recently occupied the attention of the Courts. A manufacturer sold to the occupier of a factory a machine containing toothed gearing not completely encased as required by Section 17, sub-section 1, of the Factories Act, 1937, and thereby rendered himself liable to a fine of £100 under Section 17, sub-section 2.

Section 17, sub-section 1, stipulates that in the case of any machine intended to be driven by mechanical power (*a*) every set-screw, bolt or key on any revolving shaft, spindle, wheel or pinion shall be so sunk, encased or otherwise effectively guarded as to prevent danger; and (*b*) all spur and other toothed or friction gearing, which does not require frequent adjustment while in motion, shall be completely encased unless it is so situated as to be as safe as it would be if completely encased.

Section 17, sub-section 2, of the Act lays down that any person who sells or lets on hire, or as agent of the seller or hirer causes or procures to be sold or let on hire, for use in a factory in the United Kingdom, any machine intended to be driven by mechanical power which does not comply with the requirements of the section shall be guilty of an offence and liable to a fine not exceeding £100.

Reverting to the case mentioned. An injured workman brought an action against the occupier of the factory in which he was working for damages for breach of the duty imposed by Section 17, sub-section 1, of the Act. The occupier brought in the manufacturer as third party, claiming a contribution towards the damages on the ground that the workman's injury was attributable to the breach of the manufacturer's duty under sub-section 2 not to sell the machine with the parts not encased.

The Court held that, in view of the terms of Section 17, sub-section 2, of the 1937 Act, the manufacturer owed no duty to the workman and was, therefore, not liable to contribute to the damages in spite of the fact that he was more or less responsible for the defective casing on the article concerned.

This is an important ruling from the factory occupier's point of view, for it means that he must make sure that any electrical device or any type of machine driven by power in his factory and used by his employees must be properly inspected by the employer to make sure that it is safe to use.

I ought to say in passing that if machinery is not properly guarded, the employer is liable to an injured workman for special damages, general damages and he is also liable to a penalty. Although the penalty (£100) is comparatively small, damages might run into thousands of pounds.

I strongly advise the employer who purchases such machines to obtain some guarantee before they are used, so that if any expenses are incurred through defective construction, either by the absence of a suitable guard or other mechanical defects, the manufacturer will indemnify the purchaser.

Batti-Wallahs' Society

THE importance of local government and the central body maintaining an even balance of power was emphasized by Mr. Desmond Heap at last week's luncheon of the Batti-Wallahs' Society. Mr. Desmond Heap, who is comptroller and city solicitor to the Corporation of London, in tracing the history of the origin and development of local government, referred to the establishment of national authorities which tended to swing the balance of power towards the central government. He gave some interesting details of the history of the City Corporation and the unique position it holds in this country.

Mr. T. C. F. Bigland, the "mate," announced that the next luncheon would be held on 26th March, when an address would be given by Vice-Admiral A. C. G. Madden, Second Sea Lord.

VIEWS on the NEWS

By REFLECTOR

A CORRESPONDENT who was present at the meeting tells me that the unusual subject of the seventh annual Manchester University Lecture attracted a record attendance of members of the I.E.E. North-Western Centre last week. The lecturer, Mr. H. B. Charlton, Professor of English Literature at Manchester, chose as his title "Why Bother About Poetry?" Those who expected a profound philosophic or artistic analysis of poetry were agreeably disappointed; agreeably, because they were treated instead to an absorbing essay delivered in a humorous and informal manner. Professor Charlton confined himself to showing, by apt examples from the works of Keats, Wordsworth and Browning, that since poetry depends on the emotional, intellectual and pictorial content of words, it increases the powers of imagination and consequently capacity for human sympathy — a capacity which should be cultivated by the electrical engineer in his role as individual and citizen.

* * *

"Janus" in the *Spectator* quotes a report by a writer in another paper that he has received from the chief Press and information officer of the B.E.A. "a most interesting and useful novelty, a slide rule which gives 45 cocktail recipes almost at a glance." "Janus," deprecating the spending of money in this way by nationalized industries, says that he does not know whether the initials stand for British Electricity Authority or British European Airways. It is not the former, of course, but the confusion is pardonable. All along I have protested against this duplication of initials and this suggestion that *our* B.E.A. is encouraging the use of any other "juice" than electricity is too much.

* * *

I had thought that electric fences depended for their effectiveness upon the sensitivity of animals' noses. I was wrong, it seems; temperament comes into it. A correspondent to a farming paper says:— "As long as cattle retain any individuality of character I cannot agree . . . that even the best erected fence of the most up-to-date and efficient equipment will enclose the truly insensible animal."

* * *

Three or four weeks ago I mentioned suggestions that there should be a change from castings to sheet steel construction in many more directions. I pointed out that such a change was not easily made as it often involved a major convulsion in production systems. In a letter to the *Economist* Mr. L. P. Newman, chairman of the Council of Ironfoundry Associations, comments on a previous correspondent's contention that a considerable saving of material would result from the greater use of steel instead of cast-iron in the production of gas and electric cookers. He says that one firm of cooker makers considers that it would take at least three years to re-tool and re-equip its plant to produce all-steel cookers to the exclusion of any others. So far as electric cookers are concerned the trend towards sheet steel construction has gone a long way and there cannot be much scope for economy in cast-iron in this direction.

* * *

How nice it would be to think that public appreciation of Electricity Boards was general; but, alas, it is not. By contrast, here is a quotation from a letter in the *Oxford Times*:—

> "Consumers are entirely defenceless against these Boards. . . . These fantastic octopi stretch out their slimy tentacles from their palace-like headquarters and fasten their foul terminal suckers on the population completely without hindrance."

I seem to have been badly deceived by the mild appearance and manners of the members and officials of Electricity Boards with whom I am in frequent contact. They have probably shown me only the Dr. Jekyll side of their characters.

VISITORS FROM AMERICA

Team to Study British Electricity Supply Practice

LAST week we reported that a party of representatives of the United States electricity supply industry, visiting this country under the auspices of the Anglo-American Council on Productivity, was arriving on 1st March. We now reproduce a photograph taken at London Airport on their landing.

At the Airport to welcome them were Mr. J. D. Galloway (Anglo-American Council on Productivity), Messrs. W. M. Tulip and R. B. Richardson (who were the leaders of two parties from the British electricity supply industry which visited the United States) and Mr. A. Taylor (B.E.A.) who is the tour manager.

The leader, Mr. Chandler W. Jones, vice-president of the Narragansett Electric Co., Rhode Island, told our representative: "We are to confer with the British Electricity Authority on their power matters. It is a return visit and is, I am sure, to our mutual benefit. I think we are bound to learn something and benefit by coming to Britain. For most of us it is our first experience of a nationalized authority. We shall be most interested."

Mr. Harvey E. Bumgardner, a research engineer with the Detroit Edison Co., said: "We hope to study every aspect of generation, distribution and transmission. We are all glad to be here."

On Monday the visitors were received at the B.E.A. offices at Wensley Street, London, by Lord Citrine before embarking upon their extensive itinerary. The following are the members of the party:—

Chandler W. Jones (leader), Vice-President, Narragansett Electric Co., Rhode Island; Gilbert X. Barker, International Vice-President, International Brotherhood of Electrical Workers, Georgia; T. E. Craddock, Secretary and Treasurer, National Rural Electricity Corp., Seymour, Texas; Jefferson C. Falkner, Manager of Electric Production, Consolidated Edison Co., New York; Pierre Frantz, Utility Workers' Union of America (C.I.O.), senior electrical operator, Waterside Power Station, Consolidated Edison Co., New York; William Good, substation operator, Detroit Edison Co., Michigan; Floyd L. Goss, overhead line engineer, Department of Water and Power, Los Angeles, California; Charles Lee Karr, Tennessee Valley Authority, Chattanooga, Tenn.; William Munger, International Vice-President, Utility Workers' Union of America (C.I.O.), Cleveland, Ohio; Floyd Parker, International Brotherhood of Electrical Workers (A.F.L.), senior despatcher, Bonneville Power Administration, Portland, Oregon; Russel M. Pennypacker, Philadelphia Electric Co., Philadelphia; F. H. Austin, power plant operator, Illinois Power Co., Decatur, Ill.; Harvey K. Breckenridge, Vice-President, Personnel & Industrial Relations, West Penn Power Co., Pittsburgh, Pennsylvania; George H. Brodnax, Vice-President and Manager, Atlanta Division, Georgia Power Co.; Edgar V. Sayles, general engineering supervisor, Consumers' Power Co., Jackson, Michigan; Gerald V. Williamson, superintendent of steam engineering, Union Electric Co. of Missouri, St. Louis, Missouri and chairman, Prime Movers Committee, Edison Electric Institute; Harvey E. Bumgardner, research engineer and member of executive staff, Detroit Edison Co., Detroit, Michigan.

The American Team arrives at London Airport. On the steps, left: Messrs. Barker, Falkner, Good and Lee Karr; right: Messrs. Jones (leader), Craddock, Frantz and Goss. Front row, left to right: Messrs. Pennypacker, Austin, Parker, Munger, Breckenridge, Brodnax, Sayles, Williamson and Bumgardner

PERSONAL and SOCIAL

News of Men and Women of the Industry

The Postmaster General has appointed **Mr. D. O. Lumley**, C.B., O.B.E., to be a Deputy Director General of the Post Office in succession to Sir George Ismay, K.B.E., C.B., who is retiring on 23rd June next. Mr. Lumley will lead the Post Office delegation at the Congress of the Universal Postal Union which is being held in Brussels in May.

British Railways announce the appointment of Mr. **H. F. Jarvis**, A.M.I.E.E., senior technical assistant (outdoor machinery) Mechanical and Electrical Engineer's Office, Doncaster, as electric traction engineer (Tyneside area) Gateshead. Mr. Jarvis was born and educated at St. Helens (Lancashire), where he served his apprenticeship with Pilkington Bros., Ltd. In 1933 he was appointed as a senior assistant engineer in the Operating Department of the North-Eastern Electric Supply Co., Ltd., and in 1935, when the operation of its electric substations in the Tyneside area was taken over, he transferred to the London and North Eastern Railway. After a period as electric control engineer at Wallsend, he served as senior technical assistant in the North Eastern Region Electrical Engineer's office at Gateshead, and in 1951 transferred to Doncaster as senior technical assistant in the electrical and outdoor machinery section of the Mechanical and Electrical Engineer's Department.

Mr. H. F. Jarvis

Mr. T. Matthewson-Dick, A.M.I.Mech.E., A.M.I.E.E., M.I.Loco.E., A.Inst.T., district motive power superintendent, York, British Railways, has been appointed district motive power superintendent, Newcastle-on-Tyne, North Eastern Region. Mr. Matthewson-Dick, who was educated at Rutherford College and Rutherford Technical College, Newcastle-on-Tyne, joined the London and North Eastern Railway at Newcastle in the Electrical Department in 1923. In 1943 he became technical assistant to the locomotive running superintendent, York, a position he held until 1947 when he was appointed district locomotive superintendent, York. In the years 1932-48 Mr. Matthewson-Dick lectured at Rutherford Technical College, Newcastle-on-Tyne, Constantine Technical College, Middlesbrough, and York Technical College, on mechanical and electrical subjects. He is chairman of the North Eastern Centre (Leeds) of the Institution of Locomotive Engineers for the 1951-52 session.

Mr. W. S. Allen, M.I.E.E., M.I.R.E., A.F.R.Ae.S., Regional Director, Ministry of Works, is a member of the recently formed Midland Regional Housing Production Board, set up by the Minister of Housing and Local Government.

Mr. A. L. Lunn, former chief electrical engineer, London Transport, informs us that he has removed from 90 to 120, Burdon Lane, Belmont, Surrey.

Mr. A. J. Colgan, A.M.I.E.E., has been appointed to succeed **Mr. J. W. Faulkner**, B.Sc.(Hons.), M.I.E.E., as meter superintendent in charge of the meter section of the Chief Engineer's Department of the North Eastern Electricity Board.

Mr. A. J. Colgan, who has been closely associated with meters and electrical testing during the whole of his career, joined the North-Eastern Electric Supply Co., Ltd., in 1932, and after early training, held various appointments in the Testing Department of that company and has subsequently been attached to the chief engineer's staff at the headquarters of the North Eastern Board.

Mr. Faulkner, who retired on 29th February, is a graduate of Victoria University, Manchester, and joined the staff of Metropolitan-Vickers in 1913. In the following year he became a student with the Cleveland and Durham Electric Power Co. In 1921 he was appointed Southern Area section engineer in the Testing Department of the Newcastle-on-Tyne Electric Supply Co., Ltd., which later became the North-Eastern Electric Supply Co., Ltd., and in 1944 he was promoted to meter and testing engineer in the Operation Department of that company.

Mr. H. T. Parker set out on 20th February on a round-the-world trip on behalf of the Plessey group of companies. He sailed on R.M.S. *Oronsay*, and expects to arrive in Sydney, Australia, on 24th March. He will be carrying out a detailed marketing survey of

Australia and New Zealand and meeting the companies' agents in those territories. He will be flying back via Canada and the United States, and expects to be away some six months.

Mr. W. G. Holmes retired on 29th February after thirty-eight years as manager of the Southampton branch of British Insulated Callender's Cables, Ltd., and the former Callender's Cable & Construction Co., Ltd. The occasion was marked by the presentation by Mr. O. W. Minshull, manager (home sales), of a cheque from his colleagues in the home sales organization. His successor is **Mr. E. Hitchen** who joined the former Callender's Cable & Construction Co., Ltd., at Leigh, in 1920. Subsequently he gained wide sales experience in Manchester and London. During the war Mr. Hitchen served as an ordnance officer, and in 1946 he returned to the newly formed British Insulated Callender's Cables, Ltd., as a sales representative in North West London.

On 29th February at a representative gathering of the staff of Hopkinsons, Ltd., Huddersfield, a presentation was made to **Mr. W. B. Dale,** M.I.Mech.E., A.M.I.E.E., to mark his retirement as general manager of the Electrical and Controls Department after thirty-one years with the company. Mr. R. McKie, director and secretary, presented Mr. Dale with a cheque on behalf of the directors and general staff; another cheque from the staff and employees of the Electrical and Controls Department was presented by Mr. D. Crabtree representing the workmen. Mr. G. Sewell, director and chief engineer, presided. Mr. Dale has been responsible for many new developments in the field of the power operation and automatic control of valves, especially in connection with the main stop valves installed by Hopkinsons in British power stations and in many important installations overseas. He has also done much pioneer work in the automatic control of pressure and temperature, and has been responsible for the design of some of the largest pressure reducing valve and desuperheaters in this country.

Mr. W. J. Girvan, O.B.E., is resigning the position of city electrical engineer and manager, Belfast, in September next. This decision, announced at a meeting of the Belfast Electricity Committee last week, is an outcome of a protracted dispute about the appointment of a deputy electrical engineer to succeed Mr. J. M'Candless, who resigned about six months ago. As we reported in our issue of 8th February (p. 297) Mr. R. P. Watson has been given the position.

Mr. W. J. Girvan

Mr. Girvan has been with the Belfast Corporation since 1914 and succeeded Mr. F. H. Whysall as city electrical engineer in 1942, having then been deputy engineer for about seven years.

Mr. N. Marsland, Bolton district manager for Hoover, Ltd., has just completed twenty-five years' service with the company and has been presented by them with a gold watch in token of his long service.

Mr. R. P. Wingate, lighting engineer for Newcastle-on-Tyne for the British Thomson-Houston Co., Ltd., has left to take up an appointment with the company's Lighting Department at Mazda House, Fitzroy Road, London, on 1st March. **Mr. J. S. Smith** has been appointed lighting engineer at the Newcastle office.

Mr. R. E. Boyd and **Mr. H. Bonsall** have each completed fifty years' service with the Automatic Telephone & Electric Co., Ltd. At the company's Strowger Works on 19th February before a large gathering of management and staff, Mr. F. C. Burstall, joint general manager, presented Mr. Boyd

Left to right: Mr. J. Mason (manager), Mr. H. Bonsall (chief of shipping), Mr. F. C. Burstall (joint general manager), and Mr. R. E. Boyd (superintendent), of the Automatic Telephone & Electric Co., Ltd., at the recent presentation at the company's Strowger Works

with television set, and Mr. Bonsa with gold wristlet watches for h elf and his wife.

Mr **Leslie Gamage**, vice-chair and joint managing dire of the General Electric Co., d., who is at present visit G.E.C. branches in Rho and South Africa, rece took the opportunity of pers ly presenting long service certi tes to employees who had comp ed twenty-one years' serv with the British General Elec Co., Ltd., in Johannesburg. In the accompanying pictur Mr. I. F. Hatting is seen receiv g his certificate while Mr. H. Littlewood, a director of B.G.E., looks on. Just behind Mr. Gamage is Miss K. McKenzie who has almost completed forty years' service with the company.

Mr. L. Gamage presenting long-service certificates to employees of the British General Electric Co. in Johannesburg

Mr. **G. Darnley Smith** (managing director of Bush Radio, Ltd., and Cinema-Television, Ltd.) has been elected chairman of the Radio Industry Council in succession to **Mr. J. W. Ridgeway**, O.B.E. (Edison Swan Electric Co., Ltd.), who has been chairman since 1948. Mr. Darnley Smith was chairman in 1947 and has been chairman of the Industry Television Policy Committee since its formation in 1948. **Mr. G. A. Marriott**, B.A. (manager of the valves and electronic devices department of the General Electric Co., Ltd., and a director of the Marconi-Osram Valve Co., Ltd.), was elected vice-chairman.

Mr. P. H. Spagnoletti, B.A., M.I.E.E. (director and general manager, Kolster-Brandes, Ltd., and manager, Brimar Valve Works, Standard Telephones & Cables, Ltd.), and **Mr. E. K. Balcombe** (managing director, A. J. Balcombe, Ltd.), have been re-elected chairman and vice-chairman respectively of the British Radio Equipment Manufacturers' Association, a constituent association of the Radio Industry Council.

The **Liverpool Electric Cable Co., Ltd.**, held its annual staff dinner at the Exchange Hotel, Liverpool, on 19th February. Mr. W. J. Terry (managing director), Mr. G. E. Jewell (director) and Mr. F. W. Freeman (director of an associate company) travelled from London to attend the function. Mr. J. T. Frost (works manager) proposed the toast of the company, and welcomed the visitors. Mr. Terry responded and thanked the staff for their loyal support throughout the year.

Mr. **Wm. C. Handley**, B.Sc.Tech., M.I.E.E., has been elected chairman of the Metropolitan Electric Cable & Construction Co., Ltd., in place of **Mr. T. H. Martin-Harvey**, A.M.I.E.E., who recently resigned from that position and from his seat on the board. **Lt.-Gen. Sir Ronald M. Scobie**, K.B.E., C.B., M.C., has been elected to the vacancy thus created on the board.

Bruce Peebles & Co., Ltd., announce the appointment of **Mr. R. W. Flux**, of the British Electricity Authority, London, to the newly created post of chief engineer of the Transformer Department, in which capacity he will be responsible to Mr. P. Butler, joint general manager, for decisions affecting the company's transformer business. Mr. Flux will take up his new duties shortly.

Following his retirement from the position of general manager of the Southern Canadian Power Co., Ltd., **Mr. J. B. Woodyatt**, president, has made the following appointments :—Mr. J. A. Page to be general manager, Mr. G. L. Rattee and E. A. Stanger to be assistant general managers, Mr. D. Anderson, plant engineer, and Mr. F. E. Rinfret, commercial manager.

The boxing section of the Telcon Social and Athletic Club staged another successful amateur tournament at the Greenwich works of the **Telegraph Construction & Maintenance Co., Ltd.**, on 25th February, when a large crowd of more than 500 saw some of the best boxing this season. Mr. J. N. Dean, managing director of Telcon, presented the prizes and among those present were Mrs. J. N. Dean, Mr. B. H. Musgrave, director, Mr. F. Leighton, works manager and president of the Club, and Mr. H. F. Wilson, technical manager.

To mark his forty years' service with the Morley Electrical Engineering Co., Ltd., Stanningley, near Leeds, **Mr. Edgar W. Furbank**, managing director, has been presented with a gold wrist watch by the directors. He joined the company as an

apprentice and became managing director in 1943.

Mr. L. E. Meeks and **Mr. H. R. Walton**, B.Sc., both previously directors of the Electroflo Meters Co., Ltd., have recently joined Elliott Brothers (London), Ltd. Mr. Meeks is identified with the production and design side of the Elliott organization. Mr. Walton, in addition to his new connection with Elliott Bros., is in charge of sales of the products of the Fisher Governor Co., Ltd., an Elliott Bros. subsidiary.

Three G.E.C. pensioners, **Mr. A. J. Burbidge**, **Mr. C. Henderson** and **Mr. J. A. Robins**, who retired during the course of the past year, were entertained by the company at the Connaught Rooms on 25th February. Mr. Burbidge started his career in the Fittings Department and eventually became the Department's manager; Mr. Henderson was chief carpenter for forty-two years, a position which his father occupied before him, and which his

Sir Harry Railing with Messrs. C. Henderson and A. J. Burbidge

son is now carrying on; Mr. Robins was responsible for case packing at Union Street for thirty-four years.

In the accompanying picture Sir Harry Railing, chairman and joint managing director of the company, is seen in conversation with Mr. Henderson (left) and Mr. Burbidge (right).

The Dramatic Group of the **Johnson & Phillips Social Club** gave three performances of Kenneth Horne's comedy, "A Lady Mislaid," last week. The play was presented at the Club's Hall in Charlton and its performance was enthusiastically acclaimed by packed houses each night. This was the Dramatic Group's eighth production since its formation in 1949.

The fifth annual dinner and re-union of the **Ex-Johnson & Phillips Association** was held at Grosvenor House, Park Lane, on 1st March. Among the ninety-five members present was the chairman of J. & P., Mr. [illegible] L. Wates, J.P., and several of the company's directors, including Mr. P. C. Cooper-[illegible]ry, Mr. A. C. Hartley and Mr. R. W. C. R[illegible]es. The toast to the Association was proposed by Mr. L. J. Ransom, the response being given by Mr. A. J. Shrosbery, chairman of the Association. After the dinner the opportunity was taken by Mr. W. F. Smith, the Association's secretary, to make cheque presentations to Mr. R. S. Miles, transformer drawing office, and Mr. A. F. G. Borthwick, paper cable test room, the two most successful J. & P. trade apprentices of the year. This was followed by an excellent cabaret.

OBITUARY

Mr. Thos. J. McBride, of the Benjamin Electric, Ltd., died in Dublin on 23rd February at the age of sixty-four. Mr. McBride had been connected with the company since 1926 and for the past twenty-four years had acted as technical sales representative in Eire and Northern Ireland.

Mr. C. A. Robinson.—The death is announced at Sutton, Surrey, on 3rd March of Mr. Clement Alfred Robinson, former manager of the Bombay Telephone Co.

WILLS

Mr. A. Vines, M.A., M.I.E.E., founder and chairman of Evershed & Vignoles, Ltd., who died on 1st December last, left £69,403 gross (£68,050 net).

Mr. S. W. Gibson, A.M.I.E.E., a former chief of the Data Department of the B.T.H. Co., Ltd., who died on 31st October last, left £4,677 gross (£4,587 net).

Mr. A. F. Lee, A.M.I.E.E., chief electrical engineer of Austin Crompton Parkinson Electric Vehicles, Ltd., who died on 27th September last, left £14,658 gross (£14,349 net).

Mr. V. W. Bone, M.B.E., J.P., M.I.M.E., late chairman and managing director of Ruston & Hornsby, Ltd., who died on 12th October, left £56,881 gross (£49,851 net).

Mr. A. G. H. Dent, A.M.I.E.E., of the B.E.A. Commercial Dept. at headquarters, who died on 28th September, left £2,797 gross (£2,531 net).

London Meter Readers

IT was stated earlier this week that about forty meter readers employed by the London Electricity Board had been stood off for two weeks with pay. The reason given was that since supervision of meter readers was introduced by the Board their work has been so speeded up that meters are attended to well within the former times, leaving them nothing to do. The situation is being discussed by the Board with the men's trade union.

The I.E.E. Dinner

Profession Needs More Trained Entrants

At Grosvenor House, Park Lane, London, last week 1,012 members and guests were present at the annual dinner of the Institution of Electrical Engineers. The President, Sir John Hacking, was in the chair and the chief guests were the Archbishop of Canterbury (Dr. Fisher) and Field Marshal Sir William Slim, Chief of the Imperial General Staff.

The Archbishop of Canterbury, in proposing the toast of the Institution, remarked that the repercussions of the electrical engineering profession upon the life of the community were immense, extending from the atom bomb to devices which saved the labour of the housewife. "I do not often go into the kitchen," Dr. Fisher added, "and I have never been allowed to wash up, because I do so much damage; but when I was in Australia and New Zealand I constantly made my way into the kitchen, because there I got the longest opportunity of talking to my host and hostess, and there I was impressed by the fact that almost everything was done by electricity. I do not think that in this country we have yet reached that stage."

The profession of electrical engineering was in the full sense of the words a great profession and it was regarded by those who practised it not merely as a job but as an avocation. He had been glad to be assured by the President that they abominated over-specialization, because he regarded over-specialization as one of the greatest dangers to our civilization. There was bound to be specialization, but it was a grave intellectual and a still graver moral danger to surrender to it. There was hardly a profession to-day which was not confronted with moral problems. There was the moral problem of whether it was free to do everything that it could do, and there he would say bluntly that there were some things which science could do which it ought not to do in the interests of human nature.

In the handbook about the Institution there were two most interesting quotations. One was from Lord Kelvin: "When you can measure what you are talking about and express it in numbers you know something about it." That implied that if one could not measure it and could not express it in numbers one did not know anything about it, and that was a grave fallacy. There was a certain truth in what Lord Kelvin said, but it was a dangerous truth because it was only half a truth. The second quotation was from John Hopkinson: "What is wanted is not to depend upon mathematics alone, but to have a general appreciation whether the thing looks about right." In that phrase "looks about right" John Hopkinson opened the door to theology as the necessary completion of mathematics or electrical engineering. Whether a thing looked about right called into play judgment, wisdom, insight, vision, a sense of proportion and everything else that went to make up truth. He commended the Institution for the magnificent way in which it served the community by obeying Kelvin's doctrine, and also for the fact that it did not lose sight of the other greater and saving truth.

His Grace the Archbishop of Canterbury

Field Marshal Sir William Slim

Sir John Hacking

Mr. J. R. Beard

Sir John Hacking, who responded, said the fact that this was the first annual dinner since the passing of King George VI, who had been the patron of the Institution, made it an appropriate occasion for pausing to take stock of themselves and asking themselves whether they were fulfilling their public duties to the best of their ability. Their members served the public not only directly, by the provision of products and services, but also indirectly by their very substantial contribution to the export trade on which this country depended. Their educational function was not so direct a service, but was even more vital to the ultimate service which the public would require.

Training of Students

All branches of the electrical industry were growing at a rapid rate, and one of the most important factors affecting their productivity was that the supply of adequate numbers of suitably trained entrants to the profession should be assured. British universities and colleges were doing excellent work in training students to standards at least equal to those provided in any other country, and those standards were continually improving to meet the needs of new and more advanced techniques, but present indications were that the number of entrants was materially less than had been hoped and that the profession was not receiving an adequate share of the output of the universities and colleges.

Consideration was being given to this matter. To obtain the desired results in the shortest time it seemed essential to build on to existing facilities and to make more effective use of the facilities which already existed; to create new facilities would cause considerable delay. A number of technical colleges had already developed good technological courses and should be encouraged to concentrate on this aspect of their activities. The training of technologists should not be limited to theoretical work; it was a tradition in this country that a certain amount of practical training was essential to the equipment of the professional engineer. The colleges, working in close association with industry, had always recognized this, and it was thought that an extension of this close association might well lead to a greater number of students going forward to the higher technological courses.

Sir John concluded with a reference to the other public service in which he was himself engaged, the electricity supply service, and to the efforts which it was making, in spite of many difficulties and much unjustified criticism, to fulfil its responsibilities.

The toast of the guests was proposed by Mr. J. R. Beard, a past-president, and responded to by Field Marshal Sir William Slim, who confessed that until he came into the room he had been under the impression that it was to be his duty to propose the health of the Institution. "However," he said, "I am not the first British general who has found himself in an awkward situation, with inadequate resources and with the odds very much against him. We British generals have not always pulled it off in those circumstances, but we have always had a jolly good bash at it."

Electronics and electrical engineering of every kind had, he said, come to play an increasingly important part in all the Services. One of their greatest shortages was not simply electronic equipment, but electrical engineers and electronic mechanics to look after it, and he appealed to those concerned with businesses which employed large numbers of such people to spare some of them not only for the Regular Army but for the Supplementary Reserve and the Territorials, and also for the other Services.

Fuel Research

THE last report to be issued by the Fuel Research Board dealt largely with the transition from wartime activities to reconstruction projects. It is now followed by a report for the twenty-one months ended December, 1950 (H.M. Stationery Office, price 2s 8d post free) which paves the way for resumption of the former practice of presenting reports annually.

In connection with investigations into the combustion of coal in gas turbines experiments were undertaken with "vortex" and straight-through combustion chambers, both designed at the Fuel Research Station. Methods of removing sulphur compounds from boiler flue gases continued to be studied, particularly in relation to the gases emitted from electricity generating stations.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Bedroom Heating

MR. C. W. BATES, in his letter in your 22nd February issue, seems to imply that there are medical objections associated with the heating of bedrooms.

It all depends on what one means by a heated bedroom. It was the intention in my article to suggest that the bedroom temperature for dressing and undressing need only be about 55 deg F and that, in the case of nurseries, oil filled radiators under thermostatic control could be maintained at a temperature of 50 deg throughout the night. No one can possibly suggest that this would be a bad thing. Indeed it would be a good thing for a child, and I speak as a father.

Mr. Bates seems to be stressing the virtues of the radiant electric fire. There are certain purposes for which a radiant electric fire is suitable but all I was trying to point out was that they can be very dangerous in bedrooms, particularly in nurseries, where small children are concerned. Surely nobody would suggest that it is desirable to leave a radiant electric fire operating overnight in a child's bedroom during very cold weather?

The whole virtue of the oil filled electric radiator is that it is completely safe. In fact it is the only completely safe electric space heating appliance.

Southampton. A. C. JOHNSON.

Portable Appliance Leads

I CERTAINLY agree with Mr. Carter's observations regarding the wastage of flex on portable tools and appliances. For a number of years I have been associated with various appliances and find that most consumers want flexes lengthened by at least 3ft. This applies particularly to irons, fires, reading lamps and wash boilers. The short flexes provided lead to the dangerous practice of consumers purchasing odd lengths of flex, very often lighting flex without earth conductor, and making an extension by means of a taped joint.

I am glad to find that some manufacturers are now fitting 6ft of flex as a minimum on certain appliances.

Southwold, Suffolk. H. K. CHAPMAN.

I SUGGEST that a solution of the portable appliance flex problem would be either to supply the appliance with double the normal length of flex or none at all. The cost could be adjusted by deducting the cost per yard from the net cost of the appliance supplied minus flex and adding the cost of the extra length. This would prevent waste and would help to stamp out the dangerous practice of extending leads with a totally different type, grade and size of flexible to that supplied with the appliance.

I have seen a three-core circular t.r.s. flexible lengthened with a twin core twisted cotton covered flex with complete disregard of earthing.

Oldham, Lancs. J. A. CARSLENG.

YOUR correspondent A. F. Carter in his letter (*Electrical Review*, 22nd February) has raised points that many contractors constantly have to face.

Very few customers willingly pay for a new flex to be fitted to an appliance when the flex fitted by the manufacturers is ¼ yd short of reaching the plug; this especially applies to electric irons. Yet the contractor cannot afford to make an allowance for a piece of flex which he knows will go to the scrap heap.

Industrial tools fitted with t.r.s. flexible when used in such places as garages and subject to oil last only a short time; if the fitting of leads was left to the contractor he would (knowing the circumstances) advise p.v.c. or armoured leads on account of their greater resistance to oil and damage.

The answer to this problem is for manufacturers to supply their goods without leads, thus avoiding waste and giving the contractor the opportunity of fitting the correct type and length, in conformity with regulations.

Southampton. R. K. MAWHOOD.

PARLIAMENTARY NEWS

From Our Special Reporter

IN the House of Commons recently Brigadier Medlicott asked the Minister of Agriculture if he was aware that agricultural production was being hindered by the almost complete cessation of development work in the provision of electricity in rural areas; and if he would endeavour to make arrangements with the electricity authorities whereby at least some amount of development work could be started, even if confined for the present to urgent cases and to cases where there was only a short distance of wire required.

Sir Thomas Dugdale said he was aware that for various reasons the initiation of new schemes of electricity supply to rural areas was slowed down in the autumn of last year. As the Minister of Fuel and Power announced on 4th February, limited expenditure would be possible this year for schemes already in progress and on some urgent new schemes.

Spreading the Load

Replying in the House of Commons last week to a question by Mr. Leather, the Minister of Labour (Sir Walter Monckton) said that excellent results had been achieved in industrial load-spreading this winter and power cuts had been avoided to a large extent. The Electricity Sub-Committee had been reviewing the position, and had recommended that Regional Boards for Industry should have discretion to relax load-spreading arrangements, in the light of regional circumstances, as from 1st March. This recommendation had been accepted by the Government and the Regional Boards had been so informed. The need remained for full use of private generating plant and for economy during peak hours by all classes of consumer.

American Arc-Lamp Gelatines

Answering Mr. C. I. Orr-Ewing, the President of the Board of Trade (Mr. Peter Thorneycroft) said that there was no record in his Department of the issue of any import licences since 1945 for arc-lamp coloured gelatines, as such, from the United States of America. It was, of course, possible that some might have been imported under a licence issued for some more general description, but arc-lamp coloured gelatines were not separately specified in the United Kingdom trade returns.

Census of Production

Mr. Remnant asked the President of the Board of Trade whether he would reconsider the Census of Production Form 330 recently issued to the electrical engineering trades; and whether, in view of the necessity to concentrate on increased production, he would postpone the completion date.

Mr. Peter Thorneycroft replied in the negative. He said that most firms found the time allowed for completion sufficient. In the relatively few cases where extension of time was needed for special reasons, the Census of Production Office always considered the request sympathetically.

Wenvoe Television Station

Captain Pilkington asked the Assistant Postmaster General when he expected the new television transmitter at the Wenvoe station, which was scheduled to cover south-west England, to be completed.

Mr. Gammans said it was too early to say when the high power transmitter would be completed, but the B.B.C. hoped to open the station on low power in August.

Fireguard Bill

Mr. D. G. Bullard (South-West Norfolk) has introduced the Heating Appliances (Fireguard) Bill. This proposes the making of regulations to enforce the fitting of protective devices to electric and gas fires and oil heaters sold to the public to prevent risk of fire or injury. Local authorities would be given powers to inspect establishments selling these appliances and to institute proceedings against those infringing the regulations. A fine not exceeding £50 is proposed for persons selling or hiring out fires and heaters for use in Great Britain not fitted with appropriate guards.

B.E.A. Grants for Research

Mr. Hugh Fraser asked the Minister of Fuel and Power whether he was aware that the British Electricity Authority and the Midlands Electricity Board had, together, donated 5,000 guineas to University College, North Staffordshire, mainly for study and research into those branches of physics connected with electricity; and if he would make a statement of the nature of the current programme for education, training and research settled in consultation with him in accordance with the terms of Section 5 (3) of the Electricity Act, 1947.

Mr. Geoffrey Lloyd said that the current programme of the B.E.A. and Area Boards provided for training and education at all levels and research into generation, transmission, distribution and utilization, including some long term researches. Details of the work in these fields carried out under the approved general programme were published in the Authority's annual reports.

NEW BOOKS

Transients in Power Systems. By H. A. Peterson. Pp. 361; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 52s in U.K.

The methods used for analysing and forecasting transient effects in electric power systems have steadily improved over the last ten to fifteen years. Professor Peterson summarizes much of the experience gained during this time in his book, and concentrates particularly upon overvoltage transients both at fundamental and natural system frequencies. Copious reference is made to practical results obtained from field tests and miniature system studies performed on a transient analyser. The differential analyser is also used to illustrate the more mathematical approach to the subject, but in general the author uses practical results in preference to theoretical derivations. The majority of information is presented in graphical form, and covers a wide range of practical conditions.

The book is primarily written for those responsible for power system design, and considers in detail the overvoltages caused by faults on earthed and unearthed systems, including the effect of saliency upon these overvoltages. System voltage recovery characteristics are introduced from the mathematical viewpoint and demonstrated by transient analyser results, and the part played by arc restriking is considered in some detail. Switching surges and discharge arrestor requirements are illustrated by field tests, and a study is made of the overvoltages caused by sudden loss of load and by open-circuited conductors. The last chapter covers a miscellany of non-linear circuits and the book concludes with several useful appendices and an ample bibliography.—K.W.W.

Fault Calculations. By C. H. W. Lackey. Pp. 296; figs. & index. Oliver & Boyd, Ltd., 98, Great Russell Street, London, W.1. Price 30s.

This is not another theoretical treatment of the calculation of power system fault conditions. Its avowed object is to provide a ready and practical technique of the subject in all its branches. Of the practicality of the technique there is no doubt; its universality is more questionable.

Practical methods of calculating the common types of system fault are based upon a number of simplifying assumptions, such as balanced phase impedances, insignificance of load currents, zero or symmetrical fault impedance. With such simplifications, usually justifiable, the technique of calculation can be straightforward, and Mr. Lackey makes it seem so. The reader is taken by the hand and led gently and explicitly through basic vector concepts and examples, vector algebra and impedance notation, network reduction and balanced faults, symmetrical components, sequence impedances, and a variety of practical fault problems, finishing with a brief description of a number of d.c. and a.c. calculators. Numerical examples are included. Six appendices summarize formulæ and provide more detailed data on apparatus to supplement the text.

Some of the statements are rather sweeping, and in consequence the reader would encounter pitfalls in attempting to tackle more recondite problems by the methods described, eminently suited though these may be to straightforward problems. Not all the conventions and notation employed are wholly acceptable, and the circuital-voltage convention employed, for instance, leads to the only unconvincing section of the book, that dealing with transformer polarities (pp. 212–213).

The book is profusely illustrated, clearly printed and has remarkably few typographical errors for a first edition. There is a sufficient but not extensive bibliography, no individual references being given in the text, and a good index.—G.L.

Basic Electrotechnics. By B. L. Goodlet, O.B.E., M.A., M.I.E.E. Pp. 247; figs. 139; index. Edward Arnold & Co., 41, Maddox Street, London, W.1. Price 21s.

The applications of electricity are so numerous and so diverse that to cover even the fundamentals of all of them within the compass of a single text-book and, it may be suggested, within the syllabus of a single examination, is becoming increasingly difficult. It was the late Professor Perry

who, at the beginning of the present century, developed what has now become firmly established as " engineering mathematics," jettisoning those parts of the broader subject of mathematics the knowledge of which is not essential to the study of engineering.

In the book under review, Professor Goodlet has made a very commendable effort to do the same with the comprehensive subject which goes by the name of electrotechnics. He has therefore thrown overboard what he terms the traditional time-consuming approach via electrostatics, magnetism and potential theory and also, instead of the confusion due to the use of three systems of units, he employs the M.K.S. system throughout. Thence, assuming a knowledge of the calculus and some physics, in six comprehensive chapters he gives the basic theories of what he prefers to call steady currents, electrostatic and magnetic fields, and electrodynamics followed by alternating currents and electromagnetic waves.

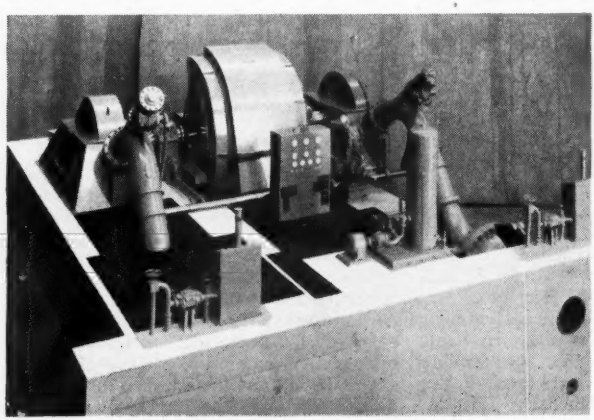
The book is intended for engineers to whom it can be cordially recommended, but for students who have a good foundation of the fundamentals of electrical science it can also be recommended as affording a concise survey of the more advanced portions of the subject. A few appropriate examples (with answers) are given at the conclusion of each chapter and some useful suggestions for more advanced reading are included at the end of the book.—A.R.

Colombo Exhibition

MANY British organizations are participating in an exhibition which opened in Ceylon on 23rd February to demonstrate the aims of the Colombo Plan and to enable the countries to illustrate their resources, products and culture. The theme of the United Kingdom is the contribution being made by Britain to South-East Asia under the Colombo Plan through the provision of machines and materials, financial aid and the supply and training of technicians.

Besides at present displaying examples of circuit breakers, ring main isolators, busbar distribution systems and other distribution equipment the English Electric Co., Ltd., has prepared three models, one showing a typical layout of a switching station using 275 kV air-blast circuit breakers, the second showing a sectioned single pole of a 275 kV air-blast circuit breaker, and the third a typical oil engine power station complete with waste heat recovery plant designed to give an overall thermal efficiency of approximately 80 per cent.

The same company has also provided for the use of the Board of Trade a sectioned working model of a twin overhead runner, four-jet impulse water turbine generating set of 40,000 kVA capacity. This exhibit should be of particular interest in view of the fact that water turbines of this type are installed in the Norton Bridge power station of the Kaksapana Development Scheme in Ceylon. The equipment was installed during 1951 and tenders have been invited with a view to doubling the capacity of this hydro-electric scheme. Further



A sectioned working model of an English Electric 40,000 kVA twin overhead runner four-jet impulse turbine hydro-electric set

Engl[illegible] Electric exhibits include a scale model of a [illegible] h.p. diesel electric locomotive: a number of t[illegible] have been supplied to Ceylon.

A [illegible]nare beam airport location beacon, the late[illegible] of Chance Brothers contributions to nav[illegible]tional safety, is visible up to a distance of 60 [illegible]s under clear weather conditions. Two sta[illegible] pumping units are shown by the subsid[illegible]. Sump Pumps, Ltd. Low horsepower eng[illegible] made by R. A. Lister & Co., Ltd., have be[illegible]upplied in thousands to South-East Asia for [illegible]ving lineshafts, lighting, pumping, driving ma[illegible]nery. The YE oil engine has been spe[illegible]lly designed by Ruston & Hornsby, Ltd., to s[illegible]sfy the demand for a heavy duty unit with a l[illegible] weight power ratio. The Lee Howl & Co.[illegible] low lift centrifugal type water pump, driv[illegible] by a 3 h.p. Higgs motor has a capacity of [illegible]50 gall/min against 45ft head, while H. J. Goodwin's shallow well pump is supplied in capacities up to 4,000 gall/hour at 250ft head.

Scale models of Ransomes & Rapier excavators include the largest walking dragline in the world. The main Babcock & Wilcox exhibit is a model of their integral furnace type of boiler for power stations and large industrial plants. The use of individual electric drive is a feature of cotton spinning machinery demonstrated by Platt Bros. (Sales), Ltd.

Scottish Board's Borrowing Powers

WHEN the Scottish Standing Committee of the House of Commons considered the Hydro-Electric Development (Scotland) Bill which seeks to extend the North of Scotland Hydro-Electric Board's borrowing powers from £100 million to £200 million, Mr. G. Nabarro moved an amendment proposing to limit the increase to £10 million. He said there were "widespread complaints of the extravagance and lack of perspicacity of members of the North of Scotland Hydro Electric Board in the fashion in which they expend the moneys they are authorized to borrow." There were eight times as many English taxpayers as there were Scottish and out of this £100 million a very much larger proportion had to be found by the English taxpayer. The bulk of the output would not be for the seven crofter counties but for the North of England grid.

Sir David Robertson, seconding, said that not one member of the Board had any experience of electricity generation or an electrical qualification. It had no full-time members and was the only nationalized board in that position.

Lord Malcolm Douglas-Hamilton suggested that the Board should have a new charter to ensure that the whole of the power was used in the north to create new opportunities for employment.

Mr. Henderson Stewart, Under-Secretary of State for Scotland, replying, said that schemes valued at £30 million were before the Minister and if the amendment were agreed they would have to stop. On the question of Parliamentary control he said there was no need for anxiety. When Parliament had approved a scheme the Board could not borrow another penny without a further submission to the Secretary of State.

After further discussion Mr. Nabarro's amendment was rejected without a vote and the Bill was committed to the House for a third reading.

Mr. Thomas Johnston, chairman of the Board, speaking in Inverness Town Hall, said that the Board had no subsidy and wanted none. It paid interest on its borrowed capital and provided sinking funds, on the same principle as local authorities did on their waterworks. It balanced its budget, built houses without subsidy, saved coal to the country, and was already supplying from its water power schemes one-fourth of Scotland's total production of electricity.

Electricity Meters

IN the first section of a comprehensive revision of B.S.37 a new arrangement has been adopted, the requirements for various types being given in separate parts, preceded by general requirements applicable to all the types.

Parts 1 and 2 (issued as a single document) are now available as follows: general clauses applicable to all types of motor meter; single-phase two-wire whole-current credit type meters.

Further parts to be issued in due course will deal with: prepayment, polyphase, kW-demand meters; transformer-operated meters, d.c., portable and precision meters.

Alterations have been made in the system of rating and in the number of ratings of single-phase two-wire whole-current meters. Owing to the world-wide shortage of materials prevailing now some of the permissible limits of error are greater than would otherwise have been specified.

Part 1 covers reference standards, definitions, general construction, terminals diagram of connections, the temperature rise, insulation, direction of rotation, name-plates, energy register and type tests. Part 2 covers standard ratings, dimensions, speed of rotation, power losses, limits of error, minimum running current, factors affecting change or error, excess current, facilities for adjustment, etc. There are appendices on the protection of pivots and jewels in transit, methods of test, precautions necessary to ensure accurate performance in service and position of name-plates.

Copies may be obtained from the British Standards Institution, 24, Victoria Street, London, S.W.1, price 4s post free.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Signal Lamp Fitting

A TOTALLY enclosed signal lamp fitting which can be mounted in a $\frac{3}{8}$in diameter hole in panels up to $\frac{1}{8}$in thick is available from ARCOLECTRIC (SWITCHES), LTD., Central Avenue,

Arcolectric totally enclosed signal lamp fitting

West Molesey, Surrey. It is suitable for normal m.e.s. bulbs (2 to 12 V) with glass envelopes up to 11 mm diameter.

Extending Rod Element

Two sizes of the new extending rod element manufactured by MABRO & Co., LTD., 42, Whadcoat Street, London, N.4, cover the whole range of replacements for electric fires. To fit these elements it is necessary simply to pull out each end to the required length. They are available for 200/220 V and 230/250 V with loadings of 750 W or 1,000 W. The standard finish is nickel plate. The small size (8in to 12in) costs 5s and the larger size (10in to 14in) 5s 6d.

Dustproof Store Boxes

Dustproof metal boxes 11in by 8in by 8 in now being made by the WELCONSTRUCT CO., Grenville Buildings, Cherry Street, Birmingham, 2, have many uses in the electrical industry as store boxes, work trays, packing boxes and for building up into storage bin units. The price is 2s 6d each.

Switched Socket Outlets

All-insulated 13 A Lundberg switched socket outlets designed for surface and flush mounting are now being supplied by the SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, Birmingham. These accessories incorporate a double pole a.c. switch with heavy silver contacts and the socket is fitted with the usual shutter. The surface pattern measures 2in by 2in by $1\frac{5}{16}$in and there are four knockouts; the dimensions of the flush pattern are $3\frac{1}{4}$in by $3\frac{1}{4}$in and it fits a B.S.1299 box.

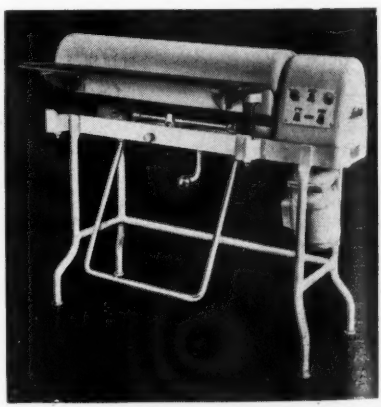
Ironer

An electric ironer suitable for hotels, restaurants, etc., now being marketed by JAMES STOTT & CO. (ENGINEERS), LTD., Vernon Works, Oldham, is easy and safe to operate. It is constructed on a strong frame of white enamelled steel tubing and a heavy cast roller with exceptional heat-retaining capacity is fitted. The electrical heating system is built in by a special method, the roller being lagged with hessian and covered with "winceyette."

Model L.585 with a 3,000 W heater loading is driven by a $\frac{1}{3}$ h.p. motor, and Model L.586 (3,600 W heater) by a $\frac{1}{2}$ h.p. unit. The motor and heating are operated by separate switches and the control panel, knee control switch (for the ironing roller) and foot operated pressure lever are all finished in highly polished nickel plate.

The table is of varnished hardwood, a clothes receptacle finished in white enamel being provided. The cloth guide under the ironing roller is of polished aluminium. As the roller has an open end, shirts, pinafores, aprons, etc., can be ironed successfully. The price is £220.

Stott semi-industrial ironer suitable for use in hotels, restaurants, etc.



Cooling Towers

Summary of I.E.E. Paper and Discussion

A METHOD for solving most problems relating to natural-draught cooling towers in a form that could, it is believed, be applied by non-specialist engineers was described by Mr. H. Chilton (Research Department, B.E.A.) in a paper submitted for discussion at a joint meeting of the Steam Group of the Institution of Mechanical Engineers and the Supply Section of the Institution of Electrical Engineers on 27th February.

It was pointed out that the dual nature of the process of convection and evaporation, by which heat from warm water was transferred to atmospheric air, made rigorous mathematical treatment difficult. An approximate "total heat" method suggested by Merkel in 1926, however, offered a ready solution of the problem for counter-flow towers in which the air rate was known and which was consequently applicable to mechanical-draught towers. Difficulties in calculating air flow had hitherto proved an obstacle to the use of this solution for natural-draught towers.

A new method was described which required only the information available from conventional performance tests and held good provided the air became saturated in passing through the tower packing, as is usual in Great Britain. Variables in cooling-tower operation were regarded as follows: total water rate to tower or, alternatively, water loading; cooling range; atmospheric dry-bulb temperature; atmospheric aspirated wet-bulb temperature (as distinct from the wet-bulb temperature indicated by the Stevenson-screen instrument); recooled water temperature, often taken as the dependent variable. Barometric pressure was not regarded as a significant variable and was assumed to be constant at 1,000 millibars.

It was shown that the performance of a natural-draught cooling tower under all operating conditions could be correlated in terms of Merkel's cooling factor (presented in the form of a nomogram) and an equation derived from the water-air ratio. Experiments had shown that the factors were simply proportional, giving a performance coefficient as a basis for comparing different tests.

DISCUSSION

In opening the discussion Mr. I. V. Robinson (B.E.A.M.A.), who had written a paper on the performance and testing of cooling towers as long ago as 1907, described some of the work he had done at that time which led him to appreciate the desirability of obtaining a figure similar to the author's performance coefficient. The author suggested that the capacity of a tower should be specified in a way which defined its performance under all operating conditions. It was doubtful whether that would be acceptable to the manufacturer, because the purchaser might attach undue importance to the few conditions under which the guarantee would not be met.

Mr. B. Wood (Merz & McLellan) sympathized with the author's desire for a simple, straightforward way of treating all cooling towers, but said the danger was that it made all cooling towers alike. There was not sufficient distinction between the performance coefficients of the different forms of packing, and probably a statistician would say that the differences were hardly significant. There was danger in the supposition that cooling tower results should plot as straight lines. A cooling tower was not a simple thing; almost every tower behaved differently from every other and each behaved differently under different weather conditions. Moreover, the author's theory omitted the effect of draughts created by wind.

Mr. P. H. Margen (Kennedy & Donkin), while also expressing sympathy with the author's desire to find a simplified relation and a constant performance coefficient, said that he, like Mr. Wood, and for the same reasons, was a little suspicious of the results obtained. There appeared in certain respects to be a major contradiction between the results which the author had deduced

from his tests and the results predicted from theory. Mr. Margen made certain suggestions about the causes of this and on how theory and test results could be made to agree, and emphasized the influence of the conclusions arrived at on economic design.

Mr. M. G. Oestreich (I.C.I., Alkali Division) referred to some tests which he had recently done on a cooling tower and said that, applying the author's method under varying conditions, he had obtained figures varying from 5·5 to 6·7 for the author's performance coefficient.

Mr. E. T. L. Emery suggested a different form for the author's performance coefficient C and said that $1/C^3$ raised to any convenient power of 10 might be a preferable factor, rather than C itself.

Mr. P. Betts (Merz & McLellan) agreed with the author that a single test of the capabilities of a tower, no matter how carefully conducted, was very misleading.

The author, in reply, said that his method, whatever imperfections it might have on the theoretical side, appeared to be fairly constant for various tests on a given tower. It was not a prediction; it was merely a statement of actual experience in convenient form. The only assumption which had to be made was that other water cooling towers would behave in a similar way to the ones which had been tested.

Electricity Supply in the U.S.A.

LAST year's expansion of public electricity supply in the United States greatly exceeded that of any previous year. Particulars given in the *Electrical World* show that 7 million kW of generating plant was installed, bringing the total to 75 million kW. A further 9 million kW is scheduled for this year and 11·7 million kW for 1953. Of the 75 million kW, 56 million was in thermal and 19 million in hydro stations, which generated respectively 272,000 million kWh and 98,000 million kWh, making the total 370,000 million kWh compared with 329,000 million in 1950. Fuel consumption amounted to 104 million short tons (2,000 lb/ton) of coal and 64 million barrels of oil, equivalent to a coal figure of 1·17 lb/kWh generated as against 1·49 lb in 1950 and 1·34 lb in 1941.

Sales of energy to 47 million consumers aggregated 317,000 million kWh; 156,000 million kWh went to 258,000 large industrial users, 57,000 million kWh to 5,500,000 small power and lighting consumers and 77,000 million to 39 million residential consumers (i.e., 147 million people comprising 95 per cent of the population). Of the total revenue of $5,640 million, $1,550 was contributed by heavy industry, $1,465 million by small power and $2,175 million by residences. The average number of kWh per residence rose from 1,830 in the previous year to 2,000.

An increase in gross revenue of power companies of 9·9 per cent was not enough to meet rising operating expenses. Expenditure on fuel increased by 13 per cent, due principally to lower than average river flow at hydro stations. Wages and salaries and obsolescence went up by 9·6 per cent and other operating expenses by 4·5 per cent.

According to *Electric Light and Power*, in addition to the 370,000 million kWh produced by public utilities, 62,000 million kWh was generated by industrial and railway plants for their own use, bringing the total U.S.A. figure to 431,000 million kWh, which was 43 per cent of the estimated world figure. The U.S.S.R. generated 10 per cent, Canada 6·5 per cent and other countries 40·5 per cent. As a measure of potential consumption, it is estimated that full residential electrification would require 12,000 kWh a year for a five-roomed house, or with a heat pump 18,600 kWh. In 1951 the average residential bill was $52·7 for an average income of $4,729 (118 per cent increase over 1940).

History of Telecommunications

THE General Post Office has issued a booklet, "By Cable . . . By Wireless," which in a concise form describes the history and operations of the system of world-wide telecommunications. The practical information given will be of help to the users of the services. For example, there is a chapter on the cost of cabling, and another on how to make the fullest use of the services at the smallest cost.

Commerce and Industry

Lighting Restrictions Relaxed

Supply Agreements and Private Plant

THE Ministry of Fuel and Power announced last week the relaxation of lighting restrictions. Under the Electric Lighting (Restriction) Order, 1949, the use of electricity for lighting in shop windows, shops, restaurants, hotels, places of entertainment or for advertisement purposes is restricted each winter between the hours of 7 a.m. and 7 p.m. (Monday to Friday). These restrictions would normally come to an end on 4th April.

The Minister has reviewed the position and so far as can be foreseen the generating plant available in March during the evenings will be adequate to meet the load. Accordingly, he has made a licence permitting the use of electricity for these purposes from 5.30 p.m. daily during March.

Recently the Electrical Sign Manufacturers' Association made a request that the restrictions should be lifted at 1 p.m. This was rejected, as was also an alternative suggestion that the restricted period should end at 5.30 p.m.

Private Generating Plant

It is stated by the Federation of British Industries that the British Electricity Authority has agreed to a standard form of clause for endorsement on existing supply agreements covering the use of private generating plants. This clause provides that if the consumer desires to use such plant in contravention of the terms of an existing agreement the Electricity Board concerned will be prepared to negotiate a new agreement upon terms and conditions arranged between the parties. Any such endorsement connotes that the terms embodied in the agreement are subject to revision if a continuance of the existing terms under the new agreement would have an adverse financial effect upon the Boards.

Buenos Aires Approval Regulations

During the past few months several decrees have been issued by the Municipality of Buenos Aires concerning domestic electrical apparatus and materials which must be officially approved before they may be put on sale for public use. In some of these decrees it is stated that the equipment concerned must comply with the IRAM specifications, while in other cases the requirements are set out in the decrees themselves. The following are brief details:—

Decree No. 16,241 of 14th September, 1951, relates to the following items: heaters in general; cookers and water heaters; bath water heaters; fires and radiators; toasters; laundry irons; boiling plates; ovens; plugs and sockets. Decree No. 21,356/951 of 10th December, 1951, relates to electrically operated gas-lighters; immersion heaters; tank heaters. Decree No. 21,357/951 of 10th December, 1951, covers lampholders; conduits, boxes and accessories; switches up to 250 V 40 A; fuses. Further information may be obtained on application to the British Standards Institution, 24/28, Victoria Street, London, S.W.1, quoting reference ELE/38.

Radio Shows

The Radio Industry Council announces that the National Radio Show will be held at Earls Court, London, from 26th August to 6th September. There will be restricted admission on 26th August.

The Northern Radio Show, City Hall, Manchester, is to be opened on 23rd April.

The Radio Component Show will be held at Grosvenor House, London, from 7th to 9th April.

Electric Locomotives for Brazil

The first of fourteen 1,070 h.p. 3,000 V d.c. "Metrovick" electric locomotives has just been shipped to Rede Mineira de Viacao, Belo Horizonte, Brazil. These are 50-ton four-axle (Bo-Bo) mixed-traffic locomotives and are

The first of fourteen "Metrovick" electric locomotives for Brazil being loaded at Liverpool

being constructed at the Metropolitan-Vickers-Beyer, Peacock Works, Stockton-on-Tees. The accompanying picture shows the locomotive body being loaded on to S.S. *Polaro* at Alexandra Docks, Liverpool.

Large Hydro-Electric Contract

A contract to the value of nearly £4,500,000 has been secured by the Mitchell Construction Co., Peterborough, for the construction of two dams and five miles of tunnels, for the North of Scotland Hydro-Electric Board. The site of the work is Glen Moriston, 40 miles from Inverness. About 750 men will be employed on the work.

Brighter Homes Exhibition

Hints to the housewife on the use and maintenance of electrical equipment are a feature of the North Western Electricity Board's stand at the *Daily Dispatch* Brighter Homes Exhibition which closes to-morrow (8th March) at the City Hall, Manchester. Special displays cover the lagging of hot water tanks, the importance of using only tested and approved electrical apparatus, localized lighting, the merits of electric blankets, and the application of the " stitch in time " technique to the repair of electrical equipment. A representative display of modern appliances is on view, while in the theatre demonstrations and film shows deal not only with cooking but also with laundry and " cold cookery " with a refrigerator.

A representative collection of washing machines is to be seen among general displays by Burke & Co., Ltd., and the Park Wireless Depot. Individual washer manufacturers include Wilkins & Mitchell, Ltd. (" Servis "), Hoover, Ltd., and the Burrough Electrical Co., Ltd. Besides showing their clothes dryer and airer and their ozonizer, J. & H. Walter, Ltd., demonstrate a no-cord iron and board. S. & S. Products, Ltd., show their free flex iron and aid. The new Singer model " 90 " iron is to be found with examples of sewing machines.

The Hoover floor polisher makes its first appearance among standard, junior and " Dustette " vacuum cleaners. With the Electrolux polisher is the new model " 33 " heavy duty cleaner for use in offices, warehouses, hospitals, hotels, cinemas, etc. Lighting fittings in " Perspex," chromium plating, copper, etc., draw attention to the Radio Installations stand.

Electricity Supply Staff Salaries

Writing in the official journal of the National Association of Local Government Officers, Mr. L. G. Moser says that a claim has been submitted for consideration on 18th March by the National Joint Council (Administrative and Clerical Grades), Electricity Supply Industry, for an increase of not less than 10 per cent in the salaries of all officers within the Council's scope. The claim is related to the continuous rise in the cost of living since the last claim was submitted and to the increases in wages and salaries generally since that time.

Crawley Factory Extension

F. R. Bullen and Partners inform us that they were the consulting engineers responsible for the design of the Bowthorpe factory extension, Crawley, mentioned in our last week's issue, and that Mr. F. E. Fowle, A.M.I.C.E., of the firm, supervised the work.

Test Kitchen

To assist them in work connected with household and food advertising accounts Young & Rubicam, Ltd., have now installed a test kitchen at their premises at 285, Regent Street, London, W.1. Equipped with a Jackson electric cooker, Berry water heater, " Prestcold " refrigerator and Hoover washing machine, the kitchen will be utilized for creating and testing recipes using clients' products, taste-tests carried out by the agency and work connected with washing tests and photography. Part of the kitchen, which has fluorescent lighting and

Test kitchen installed by Young & Rubicam, Ltd.

is electrically heated, is set up as a dining room with dining table for taste-testing and wall seating suitable for interior photographic shots.

Cable Display Panel

At the Service Centre in Queen Street, London, E.C.4, of the London Electricity Board, a panel provided by the Cable Makers' Association is now on view. As will be seen from the illustration, the panel bears over thirty sample lengths of wires and cables made by C.M.A. companies. Each is briefly described and in the centre of the panel is the C.M.A. trade mark flanked by the names of the members of the Association.

Olympia Strike Averted

A threatened strike of electricians employed at Olympia in the preparation of the Ideal Home Exhibition was averted last week. The men claimed an extra 2d an hour "exhibition money" which the employers were not prepared to pay. After discussions it was agreed that the matter should go to arbitration, a daily bonus being paid in the meantime.

Contractors and Rural Development

A talk was given to members of the Electrical Contractors' Association on Thursday, 28th February, at Tunbridge Wells, by Mr. E. C. Claydon, Sub-Area agricultural engineer of the South Eastern Electricity Board, on the subject of rural development. A description was given of various aspects of farm electrification and illustrated by means of lantern slides, chiefly of local installations. The Tunbridge Wells manager, Mr. T. W. Dann, introducing the speaker, said he hoped that this meeting would strengthen the good relations already existing between the E.C.A. and the Board. Mr. Strange, proposing a vote of thanks, said he appreciated the help that could be given by an unbiased consultant

C.M.A. display panel at a London Service Centre

service such as that described, and hoped that his members would be able to make use of the service. The meeting was attended by sixty-seven members of the E.C.A.

Switchgear Makers' Activities

The annual sales conference of Bill Switchgear, Ltd., was held recently in Birmingham, and was attended by the area sales managers, senior sales engineers, and head office executives. The accompanying photograph was taken during

At the Bill Switchgear Sales Conference

Front row, left to right: Messrs. A. W. Zelley (London area manager), R. A. Bill (managing director), R. W. Bill (chairman), H. G. Palfreman (sales manager), H. H. Pollard (Manchester area manager). Back row: Messrs. J. D. Harris (manager, Scottish branch office), N. Payne, G. H. Garbett, C. Baker and C. G. Bachelor (area sales engineers), and Mr. W. L. White (Southern Counties area manager)

the conference. The extension to the Birmingham factory of the company has now been completed. The site is adjacent to the company's present works in Aston Lane. The extension has three floors which, with subsidiary buildings, adds a further 30,000 sq ft of production space.

War Damage to Factories

Industrial representatives in areas containing a number of important war factories are being invited by the Ministry of Supply to form small self-help panels prepared to assist each other with labour, materials, plant and any other facilities they may have available in the event of damage occurring in wartime.

The main task of carrying out repair work to factories damaged in war will fall upon the Works and Buildings Emergency Organization, as part of the National Civil Defence arrangements. It is considered, however, that factories engaged on important war work should themselves introduce and operate a voluntary system of self-help and should be able to provide immediate first-aid from their own resources to get factories back into production as quickly as possible. Where repair work could not be undertaken by the panels, the matter would be referred immediately to the Emergency Organization. The Regional Controllers of the Ministry of Supply are preparing to set up panels in their areas.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £148 0s 0d
COPPER, H.C. Electro	ton £227 0s 0d
Fire Refined 99·7 per cent ..	ton £226 0s 0d
Fire Refined 99·2 per cent ..	ton £225 10s 0d
COPPER Tubes	lb 2s 2d
Sheet	ton £280 0s 0d
H.C. wire and strip	ton £254 0s 0d
LEAD, English	ton £171 10s 0d
Foreign	ton £170 0s 0d
MERCURY	flask £73 10s 0d
TIN	ton £976 0s 0d
ZINC, G.O.B. Foreign	ton £190 0s 0d
Electrolytic	ton £194 0s 0d
BRASS Tubes	lb 2s 1d
Sheet	lb 2s 4½d
Wire	lb 2s 7½d
PHOSPHOR BRONZE	
Wire	lb 3s 7½d
RUBBER, No. 1 R.S.S. spot ..	lb 32½d–33½d

Copper Cable Exports

The Board of Trade announces that from 3rd March covered and insulated cables and wires "wholly or mainly of copper or of copper alloys" only require individual export licences if the f.o.b. value is less than the value of the copper or copper alloy content, calculated at £400 per ton. Hitherto exemption of these goods from individual licensing was confined to those with a value of at least £700 per ton of copper content or £600 per ton of copper alloy content. This marginal relaxation is introduced to free as far as possible the normal traditional export trade in these goods. The change has been effected by cancellation of the existing open general licence for copper goods and issue of a new one. There has been no change in the price per ton below which other manufactures wholly or mainly of copper or of copper alloys are restricted. The goods affected are those described in Group 6 (2) of the First Schedule of the Exportof Goods Control Order, 1951, as "Goods (subjected to any process of manufacture) wholly or mainly of copper or alloys mainly of copper, not elsewhere specified in this Schedule."

T.U.C. and Consultative Councils

Proposals for strengthening trade union representation on Electricity and Gas Consultative Councils have been made by the General Council of the Trades Union Congress. In the General Council's view, Consumer Councils should be independent of the Area Boards in all respects; members of Councils should not be members of Boards and Boards should not be formally represented on the Councils. Consultative Councils should publish annual reports separate from those of Area Boards and the meetings of Councils and their local committees should be open to the Press.

Manufacturing Progress—1951

In referring to the activities of Lancashire Dynamo Holdings, Ltd., in our issue of 15th February the name of one of the companies in the group—British Electronic Products, Ltd.—was wrongly given as Electronic Products, Ltd.

Trade Announcements

The **Merchant Adventurers, Ltd.**, announce that they have acquired a new factory and works in Portland Road, W.11.

Mr. T. D. Hope has been appointed representative for Northern Ireland and Eire for **Metway Electrical Industries, Ltd.** He will also represent the associated company, **Barries Electrical Agencies, Ltd.**

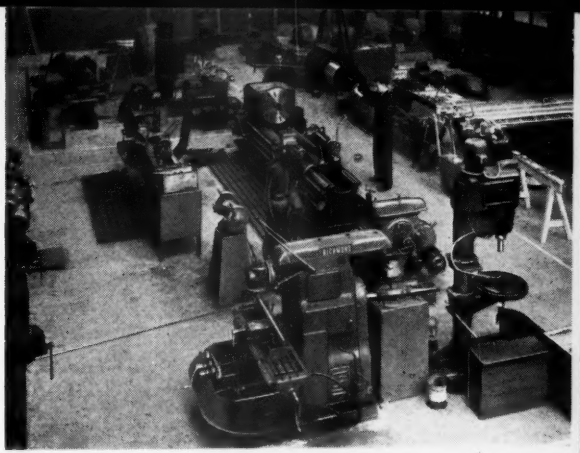
The **Quasi-Arc Co., Ltd.**, Bilston, Staffs., announces that as from 1st April next sales and service of "Unionmelt" automatic welding plant, powder and wire will be transferred to its associated company, Fusarc, Ltd., Team Valley, Gateshead-on-Tyne, 11.

Mercury Vapour Detector

In the description of the mercury vapour detector which appeared on page 1316 of the *Electrical Review*, 28th December, 1951, it should have been pointed out that this instrument was developed by Hendrey Relays, Ltd., in collaboration with H.M. Government and Hanovia, Ltd. It is marketed exclusively by the latter company.

Electrical Repairs

Improved Facilities for the Midlands

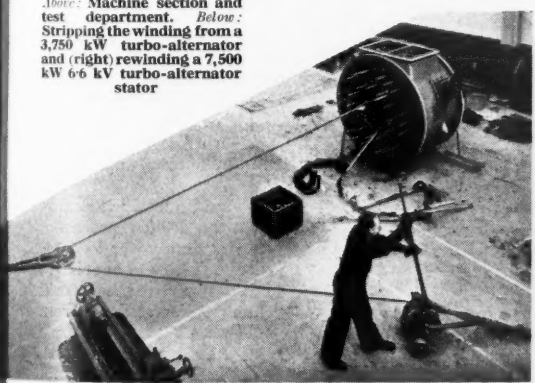


THE opening by British Electrical Repairs, Ltd., last year of a completely new works in Church Road, Perry Barr, Birmingham, adds greatly to the company's electrical repair facilities in the Midlands area where it has had establishments for thirty years. The company was formed in 1919 with its head office in Manchester, and now operates fifteen works, giving electrical repair service in Bath, Birmingham, Cardiff, Chesterfield, Edinburgh, Glasgow, Hawick, London, Manchester, Newcastle and Swansea, and the surrounding areas.

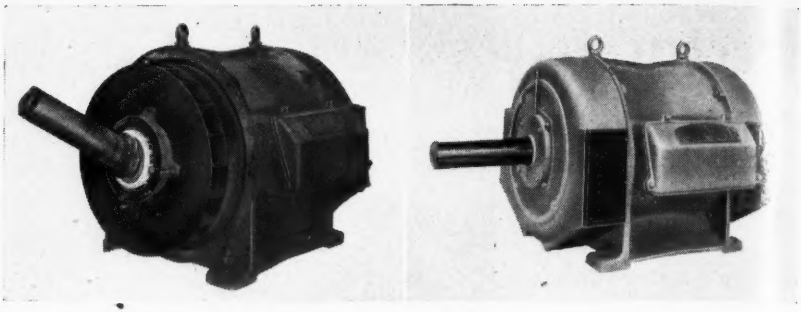
Whenever possible the repairs, rewinding, etc., are done in the works, but if this is impracticable as in the case of the larger equipment, the work is carried out on site, any necessary replacement windings, coils, bearings, commutators, sliprings, etc., being manufactured in the works.

When we visited the new Birmingham works recently the largest job in progress was the complete rewind of a 6·6 kV 7,500 kW turbo-alternator stator. We were informed that the largest turbo-alternator dealt with at Birmingham so far was a 16,500 kW machine. During the war the old works succeeded within ten days in reconditioning two 2,500 kW turbo-alternator sets which had been "sabotaged" in the Cherbourg dock generating station. Another noteworthy job was the repair of a 2,000 kVA alternator of Swedish manufacture for a colliery. Although no drawings were available, a complete new core was made for the machine in a very short time to replace the badly damaged one.

The largest motors handled in the works have been 5,000 h.p., d.c., and 4,000 h.p., a.c., the maximum size for transformers



Above: **Machine section and test department.** *Below:* **Stripping the winding from a 3,750 kW turbo-alternator and (right) rewinding a 7,500 kW 6·6 kV turbo-alternator stator**



A motor before and after repair

A 500 kVA, 33/11 kV transformer under repair and (below) vacuum impregnation section

being 3,000 kVA, 33 kV, though larger units can be dealt with. Equipment under repair at the time of our visit included several large armatures for excavating machines, a 370 h.p. pump motor, welding and other transformers. Several lifting magnets were also being rewound.

Two Wharton cranes with high head room are available for handling loads up to 10 tons, but for larger equipment up to as much as 50 tons manhandling by means of hydraulic jacks and Trewella winches is employed. Ring bolts are concealed in covered boxes in the floor. A large pit is also available for dealing with extra high equipment.

Vacuum impregnation plant used in connection with the coil winding includes one 33 kW and two 9 kW drying ovens and an impregnation chamber fitted with 24 kW immersion elements. There is also a trichlorethylene degreasing plant. Various types of modern machine tools, lathes, drills, milling machines, etc., are installed for shaft manufacture and general machining operations. Welding and metallization by the Metco process is in general use.

The electricity supply to the works is stepped down from 11 kV to 415 V, by a 400 kVA English Electric transformer

install[illegible] with Ellison h.v. and l.v. switchgear i[illegible] a separate substation building. To furnis[illegible] l.c. for test purposes there is a motor gener[illegible] r set, which also drives a variable frequ[illegible]y alternator set. A booster is provi[illegible]d to maintain voltage and there is a [illegible]ott-connected bank for two-phase suppl[illegible]. H.v. supplies (11 kV, 6·6 kV and [illegible] kV) are available from a special transformer. There are arrangements for insulation testing up to 60 kV and for testing and filtering transformer oil.

To achieve a pleasant lighting of an intensity of 22 lumens/sq ft, 27 Benjamin fittings have been arranged in three rows in the roof, the centre row having 1,000 W tungsten lamps and the outer rows 400 W fluorescent lamps.

SWISS ELECTRICAL INDUSTRY

Depression Fears Prove Unfounded

THE output of the engineering industry of Switzerland is estimated at 2,000 million francs, about half of which is sold abroad and constitutes the most important item in Swiss foreign trade. In his report on economic and commercial conditions in Switzerland* Mr. L. G. Holliday, Counsellor (Commercial) to H.M. Legation at Berne, says that in the first half of 1950 orders fell off and there were fears of a serious depression. Costs of production in some branches were so high that Swiss goods could not compete with imports, notably from Germany. From August onwards a radical change came over the engineering industry, which, at the end of 1950 and up to March, 1951 (the report is dated April, 1951), was overwhelmed with orders sufficient to assure full production for many months. Thanks to an improvement in the second six months, machinery exports rose in value from 772 million francs in 1949 to 863 million in 1950. Prices had adjusted themselves to a remunerative basis and the outstanding problem had become one of scarcity of raw materials.

The trend of business in the electrical engineering industry was largely parallel to that in the general engineering branch, but an improvement set in in the first quarter of 1950, due to a rush of export orders, on which big concerns are dependent to the extent of 80 per cent. Their development is closely allied to the fluctuation of the international economic and political situation. In the home market, stocks of small motors and plant were readily disposed of and new purchases made. Higher export sales in 1950, as against those of 1949, included electric locomotives (from 2 to 9 million francs) and dynamo-electric plant (from 81 to 99 million).

In dealing with the market possibilities for United Kingdom manufactured goods, Mr. Holliday gives little indication of the demand for electrical equipment. He states, however, that the lighting technique of Switzerland is highly developed and there is a big demand for lighting glass. Practically all lighting glass is imported, but special attention has to be given to the exacting demands of the market in design and quality. Sales are generally made to manufacturers, who incorporate the glass in their locally produced fittings. Fluorescent lighting is widely used and in this connection there have been inquiries for opal glass diffusers. The prospects for fluorescent lamps are not good in face of Dutch and American competition.

Electricity Supply Progress

The annual report of the Swiss Federal Electricity Department shows the development of output and consumption of electricity. In 1938–39 the output was 7,176 million kWh, of which 7,089 million kWh was produced at hydro-electric power stations. By 1949–50, the output had grown to 10,770 million kWh (10,318 million hydro-electric).

Lower water level in the winter period of 1949–50 seriously handicapped production. Installed capacity at the end of 1949 was 2·7 million kW, which was estimated to rise to 2·95 million by October, 1952. In October, 1950, thirteen major schemes were

* H.M. Stationery Office, price 4s 6d net.

under execution, each with a capacity of at least 10 million kWh. No additional thermal plants were under construction.

The domestic installations, which were more than doubled in number in the ten years ending 1949, included at that date 395,000 cooking stoves, 390,000 hot water boilers, 2,450,000 heating appliances, 16 million lamps and 75,000 refrigerators.

The structure of Swiss fuel requirements has undergone a marked change since the war. In 1938 it was estimated that coal and coke furnished 80 per cent of the total, electricity 14 per cent and oil 6 per cent. In 1946 coal supplies represented about 54 per cent and electricity as much as 35 per cent. The extension of the electricity grid, difficulties in obtaining suitable coal deliveries and rising oil imports have given an impetus to greater use of oil and electric power. The proportions of fuel consumption in 1950 were assessed at coal and coke 59 per cent, electricity 22 per cent and oil 19 per cent.

ELECTRICITY CONSUMPTION IN MILLION kWh

Year	Domestic	Railways		Chemical metallurgical industry	Other industry	Electric boilers	Losses and used by pumps	Total consumption in Switzerland	Export
		Federal	Others						
1938–39	1,411	549	173	1,404	819	506	751	5,613	1,563
1947–48	3,079	718	237	2,033	1,485	1,052	1,434	10,038	742
1948–49	3,187	708	241	1,876	1,502	503	1,393	9,410	570
1949–50	3,400	728	242	1,764	1,548	766	1,437	9,885	985

STREET LIGHTING NOTES

ESTIMATES of the SALFORD Corporation Lighting Committee amount to £71,000, an increase of £20,000 on the current year. Mr. Leonard Preston, the street lighting superintendent, states that little money has been spent on lighting in Salford since before the war. It is intended to recall all existing fittings for reconditioning so as to give them ten or fifteen years' extra life.

SMETHWICK Corporation is to accept an offer of the Midlands Electricity Board to provide experimental lighting along a selected section of a secondary road, but they will only be able to provide six columns and lamps. It has been suggested that the lights should be installed in Grange Road between Waterloo Road and Bearwood Road.

ENFIELD U.D.C. Works Committee has recommended that application should be made to the Ministry of Transport for consent to borrow £13,000 for improving the lighting in a number of roads.

ARUNDEL Town Council is to investigate the question of changing over from gas to electricity for street lighting.

DONCASTER Watch Committee has approved schemes for improved street lighting in St. James' Street, Cleveland Street, Silver Street and Market Road, estimated to cost £3,235. The installation of sodium lighting in Bawtry Road from Church Lane to the borough boundary at an estimated cost of £2,500 has been under consideration and the Committee is to ask the Minister of Transport if a grant could be made towards the cost.

The Ministry of Housing and Local Government has approved the BOLDON (Durham) U.D.C.'s estimate at £1,266 for providing 43 electric street lights in Station Road, West Boldon and Cleadon Lane.

WHITBY U.D.C. has deferred consideration, until the annual estimates are being discussed, of a scheme for increasing the number of street lamps. The surveyor reported that it would cost £11,700 to increase the number from 579 to 869.

Scandinavian Scheme Abandoned

PLANS for power transmission from Norway to Denmark via Sweden have been abandoned, according to the final report by a Danish-Norwegian-Swedish expert committee. One of the reasons is that power export from Sweden to Denmark has been facilitated by a new 120 kV submarine cable in the Sound brought into use last summer, while export possibilities will be further increased when the new Swedish 380 kV network is extended to South Sweden in about two years time.

ELECTRICITY SUPPLY

Penny "Unit" Charge in S.E. Area

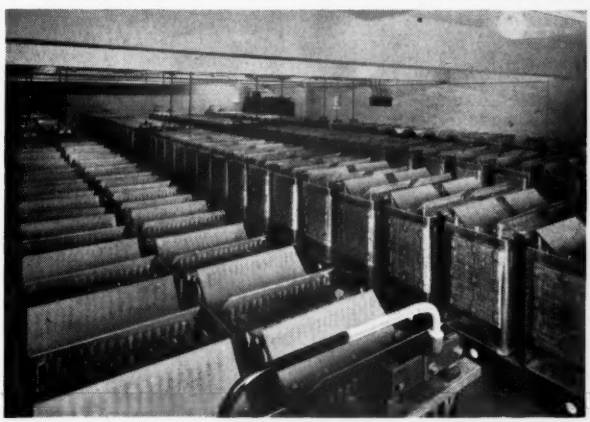
Load Spreading Decisions

RUNNING charges of ¾d/kWh on all two-part tariffs in the South Eastern Electricity Board's Area are to be raised to 1d from 1st April. Cooking, heating and power flat rates of less than 1¾d/kWh will be advanced to that price and similar adjustments will be made in certain block tariffs. Flat rates for lighting are unaffected.

Announcing these changes last week the Board stated that standardization of electricity tariffs was in progress in the whole of the Area and it had been hoped to defer alteration of the tariffs until the proposals were complete. Dearer coal and other rising costs, however, make it necessary, despite economies already achieved, to raise charges for electricity immediately. The South Eastern Electricity Consultative Council has been given full information about the Board's costs and has accepted the need for the increases. About 670,000 of the Board's million consumers will have to pay more under the revisions, but the extra cost will average only a penny a day.

Power Station Batteries

At the new B.E.A. generating station at Brunswick Wharf, Poplar, four batteries comprising 250 "Ediswan" cells have been installed for the control of all switch tripping and closing. One installation supplies current for switch closing, lighting and d.c. motors and a smaller one operates air blast and oil circuit breakers, panel indicator lamps and telecommunications. At the Bankside power station, Southwark, similar services are being operated by two batteries each consisting of 115 "Ediswan" type AH8 cells, having a capacity of 800 Ah at the 10 hr rate of discharge. A similar separate installation of 24 cells operates the telecommunication system.



Battery installation at Bankside power station, Southwark

Industrial Load Spreading

Referring to the Minister of Labour's statement on the relaxation of load spreading arrangements, at the discretion of Regional Boards for Industry, an official of the British Electricity Authority said that throughout the present winter hardly any power cuts had been necessary. On 28th January there were some small cuts in some areas, but there had been no nation-wide cuts throughout the winter. It was estimated that industrial load spreading had relieved the situation to the extent of 500,000 kW. The Minister's announcement did not necessarily mean that load spreading would be relaxed; it would depend entirely upon the local position in the Regions.

The Electricity Sub-Committee of the London and South-Eastern Regional Board for Industry on Friday decided to release industrial and commercial organizations from the obligation to spread electricity load after 10 a.m., Monday to Friday, during March. The Committee stated that the necessity for economical use of electricity during peak hours in the event of severe weather remained, and organizations with

private generating plant were requested to keep it running during March. The statement added that the response to load spreading during the winter had been most satisfactory.

Announcing the cessation of load spreading in the East and West Ridings Region, Mr. G. H. Bagnall, chairman of the Regional Board for Industry, expressed the thanks of the Board to all employers and workpeople for their co-operation and said that domestic and small commercial consumers had also helped in the avoidance of cuts.

The Welsh Board for Industry has announced that in South Wales it will be necessary to continue load spreading until 31st March.

Lussa Hydro-Electric Scheme

Glen-Lussa hydro-electric scheme, under construction near Campbeltown, is now supplying power to Kintyre. The first 1,000 kW turbo-alternator in the power station near Gartgreillan, which has been undergoing tests during the past week, is now producing power for the network of the North of Scotland Hydro-Electric Board. Installation of the second machine in the station is well advanced.

Rural Electrification in North Wales

Progress in rural electrification in North Wales was reported at the meeting of the Electricity Consultative Council held at Chester on 26th February. It was stated that eighteen small sectional schemes completed in Anglesey, Denbigh and Flint, brought electricity to 1,694 new consumers, while work on full schemes in eight counties had connected a further 988 consumers. At 31st December last the number of consumers connected under the Board's Development Scheme for North Wales totalled 2,682, made up of 1,879 domestic premises, 546 farms, 255 commercial and two industrial.

Re-wiring Technical College

Nottinghamshire County Council Education Committee has been informed that the entire electrical installation at the Nottingham and District Joint Technical College needs replacing at an estimated cost of £30,000 and the Committee has agreed to make provision for the work to be carried out over a three-year period.

Electricity in Mining Area

Houghton-le-Spring U.D.C. has received a letter from the area general manager of the Durham Coal Board regarding complaints that non-miner electricity consumers taking supplies from the network owned by the Coal Board were charged more than miners. The Coal Board stated that prices of supplies to miners were governed by agreements with the National Union of Mineworkers. Possible variations of these agreements were in course of negotiation. The Coal Board was under an obligation to transfer its electricity network eventually to the Electricity Board. The U.D.C. has expressed the hope that the transfer will not be delayed and that improvements will be made to remedy the abnormally low voltage through the system being overloaded.

Hove Application Dismissed

The Queen's Bench Divisional Court last week dismissed an ex-parte application on behalf of Hove Corporation for orders of certiorari and mandamus against the Minister of Housing and Local Government in relation to the Minister's decision that a balance of £17,000 received from electricity consumers by 31st March, 1948, was held by the Corporation in its capacity as an electricity undertaking and not in the capacity of a local authority.

The Corporation maintained that, being a local authority, the money went into the general rate fund and so lost its identity, with the result that on the appointed day the money was held by the Corporation as a local authority —it being part of the general rate fund—and not in its capacity as electricity undertakers.

Pollution of River Derwent

The hearing was concluded on 29th February of the action brought by the Pride of Derby and Derbyshire Angling Association and the Earl of Harrington against British Celanese, Ltd., Derby Corporation and the British Electricity Authority. The plaintiffs asked for injunctions restraining the defendants from polluting the River Derwent, to the detriment of the fish in the river, and claimed damages. The case had occupied thirteen days. Mr. Justice Harman, who heard it, reserved judgment.

Damage through Excess Voltage

It was reported to the Merseyside and North Wales Electricity Consultative Council on 26th February that through an excess voltage lasting from 3 p.m. to 7 p.m. at Buckley, Flints, on 17th January radio and television sets, lamps and radiators were damaged. The Council referred the matter to the Electricity Board with a request for sympathetic consideration.

Off-Peak Tariff Suggested

A sub-committee of the East Midlands Electricity Consultative Council has suggested that the Electricity Board should be asked to investigate the financial implications of a special tariff for consumers who use electricity exclusively at night.

Proposed Power Station Extension

Osgoldcross R.D.C. has been informed that it is proposed to extend Ferrybridge power station by constructing a new section to be known as Ferrybridge " B."

Engineering in Europe

Survey of Current Literature

THE maintenance of large alternators, especially the horizontal axis type, includes the very important verification of mechanical condition, eccentricity or unbalance involving, among other things, measurement of the thickness of oil films in the bearings. Strain gauges and capacitor methods suggest themselves for static measurements and also under transient conditions, if the film thicknesses are between 50 and 5μ. Below the lower extreme, other methods are required. One of the latter is the variable air-gap principle in a magnetic circuit which has the advantage that the "air" gap may be an "oil" gap without the dielectric characteristics of the oil entering into the measurement.

The most elaborate electromagnetic method is Stone's, by which displacements of the shaft relative to the bearing of the order of $\frac{1}{4}\mu$ are ascertainable. However, of the many ingenious and elaborate methods so far developed, only a comparatively small number are really suitable for continuous operation under the conditions of a power station.

An interesting solution is based on a principle evolved by Nücker and Rumpf, modified for the pad-bearings of the hydro-alternators of the power station on the lower Drac river (near Grenoble). The measuring electrodes are there permanently built into the pads of the bearing, with glass insulation, and permit of measuring film thicknesses between 0 and 150μ by the capacitance method. As the oil film always contains metal particles, short circuits are not infrequent and reliable results are obtainable only by a fairly large number of measurements. The necessary temperature readings are obtained by built-in thermocouples. An electromagnetic measuring unit is also described for showing an alternative measuring device.—"Some Recent Methods of Control and Regulation of Large Electrical Machines, Particularly Measurement of Small Thicknesses; Application to the Bearings of Alternators with Vertical Shafts," R. Langlois-Berthelot, P. Sauvage, G. Leroy and S. X. Casacci, *Bulletin Société Française des Electriciens*, Ser. 7, Vol. 1, pp. 651–668, October, 1951, in French.

Neutral Point Earthing

It has long been established that the possible maximum voltage stress in a directly earthed system is only 0·7 or 0·8 of that in an inductively earthed system, and a still lower fraction of that in a system with insulated neutral; thus a certain saving on insulation is possible. This means, paradoxically, greater safety of transformer operation, because it improves heat exchange, reduces short-circuit voltage and enables transformers to have staggered insulation. The ratio between single, two and three-phase impulse short circuits is reduced, which results in approximately equal short-circuit current conditions in every type of system. The more favourable type of transients in a directly earthed system also reduces the stress on the circuit breakers so that a saving of 20–30 per cent on switchgear becomes possible.

Interference with communication lines is in general of the same kind as that of systems with or without inductive neutral earthing and may be reduced by the same means. Only one very important and troublesome source of interference is absent from directly earthed systems, i.e., the increased corona losses during earth faults. The isolation of faults and selective protection is simpler in a directly earthed system, because there is no necessity for separating double short circuits to earth and rapid protection may be used, preferably directional and distance protection combined, installations for rapid-reclosing being assumed as a matter of course. It had been foreseen that at v.h.v. quenching

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at the current rates.—*Editors, Electrical Review.*

coils would become increasingly inefficient, especially on account of the very considerable residual corona currents at above 220 kV. This applies particularly to long and interconnected lines, for which direct neutral earthing thus becomes a necessity.

Transformation between 220 and 400 kV systems with directly earthed neutrals may with advantage be operated by autotransformers of the mobile type, which, in the U.S.A., are preferably used in sets of three single-phase units of 240 MVA rating with a tertiary winding for 80 MVA and staggered insulation. This results in a reduction of the effective transformer impedance by 16–20 per cent, which may be used for increasing transmission distance, or for improving the stability of operation.—" Neutral-point Earthing in 220 and 400 kV Three-phase Systems and its Influence on the System Layout," K. Krauss, *Österreichische Zeitschrift für Elektrizitätswirtschaft*, Vol. 4, No. 11, pp. 361–368, November, 1951, in German.

Metal Contact Surfaces

The phenomena taking place on contact surfaces are so complex that they cannot be fully understood by analysing the results of annealing and scaling tests. Yet such tests furnish valuable information about the suitability of given contact materials for special purposes. Thus neither silver-molybdenum nor silver-tungsten are suitable for use in medium-power switchgear of high repetition rate, least of all for d.c. operation where the contact resistance is of a decisive importance. The double oxides which form in the combinations of these metals over the whole range of concentrations at temperatures below the melting point of silver will cause considerable disturbances of the switching process. Even though the oxides possess a certain conductivity, it will not make up for the large increase of the oxidation rate. On strongly rubbing contacts, where the oxide skins are continuously abraded, there will be a large loss of material.

In all these cases silver-nickel will definitely be the preferred contact material, especially when the melting loss of pure silver and of its alloys would be too high. The suitability of Ag-W and Ag-Mo contacts for high-duty switchgear is not however ruled out, but requires separate investigation, because it represents a different case. The surface phenomena are then less important than the behaviour of the contact under arcing conditions and the conductivity of the contact element as a whole.—" On the Formation of Insulating Coatings on Sintered Metal Contacts," A. Keil and C. L. Meyer, *Elektrotechnische Zeitschrift* (*E.T.Z.*), Vol. 73, No. 2, pp. 31–34, 15th January, 1952, in German.

Current Transformers

A new method of representing the relations in current transformers constitutes a considerable simplification of the problem. Its main characteristic is that the influence of saturation and iron losses is considered by a single curve, from which current and angle errors for a given burden may be conveniently determined in the whole current range.

This method enables a new design method for current transformers to be evolved which permits of a better utilization of the iron of the magnetic circuit. The curve mentioned is the characteristic of the admittance of the magnetizing circuit, defined as the ratio of the fictitious magnetizing current reflected into the secondary (taking into consideration the iron losses) to the secondary e.m.f. (which is proportional to the main flux). The admittance diagram is derived by a graphical and analytical method and its significant part (that corresponding to the maximum errors) may be enlarged by graphical means.

It is clear that the basic data on the iron used must be available prior to carrying out the graphical construction which is only a convenient method of evaluating the results of measurements for design purposes. The working is shown on numerical examples.—" Research on Current Transformers," H. Kafka, *Elektrotechnik und Maschinenbau*, Vol. 68, No. 22, pp. 529–540, 15th November, 1951, in German.

Bradford Transport Costs

IN a report to the Bradford Transport Committee, the city treasurer estimates that the Transport Department will have a loss of about £100,000 at the end of the current financial year. The Committee passed a resolution that representations should be made to the Yorkshire Electricity Board urging a speedy settlement of negotiations for a new and equitable formula for payment for electricity supplied to transport undertakings, and that the formula should operate retrospectively as from 1st April, 1950.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Associated Electrical Industries, Ltd., report a consolidated trading balance for 1951 of £1,521,000, as compared with £8,440,000 for 1950, to which are added dividends, etc., of £124,000 and other income £46,000, making a total £10,491,000. From this the following deductions are made :—Interest on ten year notes, £130,000; depreciation off works, etc., £880,000; increased replacement cost of fixed assets reserve, £1,250,000; off trade investments etc., £128,000; capital duty on increase in capital of subsidiaries, £18,000; auditors' remuneration, £13,000; provisions, £148,000; taxation, £5,400,000. The net profit is £2,524,000 (against £2,496,000). The ordinary dividend for the year is maintained at 20 per cent by a proposed final payment of 12½ per cent. The ordinary dividend for the previous year was paid on £6 million capital. The dividend now recommended is in respect of £6,652,947 ordinary stock in issue prior to the recent offer of 2,217,649 new ordinary shares which do not rank for any dividend in respect of the year 1951. The 7½ per cent interim dividend was paid on £6 million capital.

The English Electric Co., Ltd., reports group profits, after deducting all charges, including £2,286,611 for taxation, of £1,355,530 for 1951, as compared with £1,101,022 for 1950, of which £1,326,721 is attributable to the parent company (against £1,049,892). The group profit includes a sum of £84,246 transferred by a subsidiary company from provision for contingencies. As already announced the final ordinary dividend proposed is 10 per cent, making 15 per cent for the year (unchanged). The new ordinary shares do not rank for any dividend in respect of the year.

Marconi's Wireless Telegraph Co., Ltd., reports a profit for the year ended 29th December last of £159,667, as compared with £164,309 for the preceding year. The profit is arrived at after deducting all charges, including £171,714 for taxation. The ordinary dividend for the year is unchanged at 7 per cent.

The Marconi International Marine Communication Co., Ltd., reports that after providing £223,000 for taxation, and deducting all other charges, the profit for the year ended 31st December last is £138,276, as compared with £111,702 for 1950. The dividend for the year is maintained at 10 per cent by a final payment of 6 per cent.

D. Napier & Son, Ltd., report a profit for 1951 of £135,561, after meeting all charges including £183,000 for taxation. This compares with £68,413 for 1950. The ordinary dividend for the year is 7½ per cent (unchanged).

Bruce Peebles & Co., Ltd., report that after providing £180,000 for taxation, the net profit for 1951 is £123,922, as compared with £122,879 for 1950. Depreciation requires £15,597, and after adding £10,295 brought in and £10,000 tax provision not now required, the balance available is £128,620. Fixed assets replacement reserve is allocated £25,000, contracts reserve £10,000, and general reserve £60,000. The preference dividend is 7½ per cent, plus a further payment (contingent on profits) of 2½ per cent, making 10 per cent, and the ordinary dividend for the year is 15 per cent (against 12½ per cent).

Sterling Electric Holdings, Ltd., reports group trading profits and sundry revenue for the year to 31st March of £92,752 (as compared with £65,590 for the preceding year). After deducting all charges, including £28,802 for depreciation and £9,618 for taxation, the net profit is £29,204 (against £11,474). From this £5,946 is transferred by subsidiary to taxation equalization account and £14,837 is retained by subsidiaries, leaving a balance available to the parent company of £8,421 (£9,315). Interest on funding certificates requires £1,261, and the preference dividend £7,150, leaving a balance to be carried forward by the parent company of £1,980 (£1,970). The consolidated balance carried forward is £84,876 (£70,029).

Mather & Platt, Ltd., report a net profit for 1951 of £293,130, as compared with £360,540 for 1950. This figure is arrived at after allocating £200,000 (£100,000) to stock contingency reserve. The final ordinary dividend is maintained at 6 per cent, and in addition a bonus of 2½ per cent is paid, making 12½ per cent for the year (same). In the previous year a jubilee bonus of 2½ per cent was paid.

Clarke, Chapman & Co., Ltd., report a net profit for 1951 of £182,545, as compared with £178,508 for 1950. The balance is struck after deducting £183,107 for taxation, £40,000 allocated to replacement of fixed assets, etc., reserve, £13,381 to deferred repairs, etc., and

£13,000 for development expenditure of subsidiary companies. The ordinary dividend for the year is unchanged at 15 per cent.

Thomas De La Rue & Co., Ltd., announce that Treasury consent has been given to the capitalization of £463,000 of the share premium account to be applied in paying up in full 1,852,000 ordinary shares of 5s each. The new shares will be allotted to holders of ordinary stock in the proportion of one for every 5s stock held. The present authorized share capital being insufficient to permit this issue, it is proposed to increase it to £2,000,000 by the creation of 3,951,936 ordinary shares of 5s each. An extraordinary meeting to consider the proposals will be held on 26th March.

Heenan & Froude, Ltd., have announced an interim dividend of 7½ per cent (against 5 per cent). This is paid on enlarged capital and includes a special jubilee bonus of 2½ per cent.

New Companies

Reosound Service, Ltd.—Registered 1st February. Capital £1,000. Electrical and radio engineers, etc. Directors : R. E. Owen and Mrs. Elizabeth H. Owen. Regd. office : 23, High Street, Sutton Coldfield.

Senrab (Accessories), Ltd.—Registered 15th February. Capital £100. Neon light tube manufacturers and fitters, fluorescent tube manufacturers, etc. Directors : A. C. Barnes and Mrs. Eileen M. Ashman. Regd. office : 1, Clabon Mews, S.W.1.

Wamota, Ltd.—Registered 15th February. Capital £1,000. To install, develop and operate radio and television equipment, and to carry on the business of radio, telephonic, television, telegraphic and electrical engineers, etc. Directors : R. J. Raphael, P. Raphael and E. Holbrook. Regd. office : 24-25, Western Mail Chambers, St. Mary Street, Cardiff.

N. S. R. Hirings, Ltd.—Registered 20th February. Capital £1,000. Electrical and general engineers and contractors, manufacturers, importers and exporters of electrical and mechanical appliances, etc. Directors : A. J. Walker and A. G. M. Walker (directors of Alex. J. Walker (Wembley), Ltd., and N. S. R. Mfg., Ltd.). Secretary : Margaret E. Walker. Regd. office : 394, Northolt Road, South Harrow, Middx.

N. S. R. Manufacturing, Ltd.—Registered 20th February. Capital £1,000. Manufacturers and dealers in public address equipment, wireless, television, etc. Further particulars as for N. S. R. Hirings, Ltd. (q.v.).

Transductors, Ltd.—Registered 22nd February. Capital £100. Manufacturers and repairers of electrical and other apparatus, machinery and servo mechanisms of all kinds, etc. Dr. R. Willheim is the first director. Secretary : M. T. Hindson. Regd. office : 79, Eccleston Square, S.W.1.

Frank Smith (Electrical) Sales, Ltd.—Registered 21st February. Capital £100. Directors : F. Smith and J. A. Andrews. Regd. office : 63, Bilston Street, Wolverhampton.

Increases of Capital

British Insulated Callender's Cables, Ltd.—Increased by £5,000,000, in £1 ordinary shares, beyond the registered capital of £12,500,000.

Santon, Ltd.—Increased by £5,000, in £1 redeemable preference shares, beyond the registered capital of £30,000.

Truvox, Ltd.—Increased by £74,000, in 15,000 redeemable first preference, 30,000 redeemable second preference and 29,000 ordinary shares of £1 each, beyond the registered capital of £1,000.

Truvox Holdings, Ltd.—Increased by £75,000, in 15,000 redeemable first preference, 30,000 redeemable second preference and 30,000 ordinary shares of £1 each, beyond the registered capital of £125,000.

Liquidations

Stockdill's, Ltd.—Winding up voluntarily. Liquidator, Mr. E. V. Balmford, 15, Station Street, Huddersfield.

Blaenau Electrical Supplies, Ltd.—Meeting on 31st March at Electricity House, Love Lane, Pall Mall, Liverpool, 3, to receive an account of the winding-up by the liquidator, Mr. A. P. Whyte.

Henfrey (Electrical), Ltd.—Creditors' voluntary winding-up. Meeting of creditors and members on 16th April at the offices of Alabaster, Stray and Clogg, 48, Cannon Street, London, E.C.4, to receive an account of the winding-up by the liquidator, Mr. A. M. Stray.

Bankruptcies

R. E. Browne, electrical contractor, carrying on business as "Browne Brothers" at 121, Market Street, Dalton-in-Furness, Lancs.—First meeting held 6th March. Public examination 16th April at the Magistrates' Court, Lawson Street, Barrow-in-Furness.

T. D. Long, carrying on business at 664, Halifax Road, Buttershaw, Bradford, electrical contractor.—Trustee, Mr. R. B. Smith, 3, Alfred Street, Leeds, 1, appointed 22nd February.

J. Hilbert, 17, Manchester Road, Haslingden, Rossendale, Lancs., radio and electrical engineer.—Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester, 2, appointed 26th February.

STOCKS and SHARES

POSTPONEMENT of the Budget date, although for no longer than a week, served to accentuate the previous heaviness in prices which had occurred in most of the Stock Exchange markets. The additional week's suspense apparently brought in more sales of stock for which no immediate support was forthcoming. In addition to this, there is the heavy strain upon money that is now being made by the numbers of new issues which absorb a material proportion of the floating cash that is usually available for investment when prices reach lower levels. Business in most markets, it may well be imagined, has fallen away to little more than a trickle. Even in the Consol Market, where there is ordinarily a steady amount of bread-and-butter business, normal activity has fallen upon quiet days.

English Electric Dividend

Some further decline in the price of English Electric ordinary—to 55s—since publication of the dividend and annual profits statement, would be accounted for mainly by surrounding circumstances. Last August the interim dividend was increased by 1 per cent; but in the light of subsequent events, and of the fact that more than a million new shares will rank for the future (but not the present) dividends, few people had seriously banked on any change in the distribution, which was raised a year ago from 10 to 15 per cent. At that time, the company's expectation was that, in the ordinary course of events, earnings should amply support the payment of that rate for the foreseeable future. Net profits for 1951, after tax of over £2¼ million, expanded to a group figure of £1·3 million, which covers four times the ordinary dividends paid. Among the first in the field, as usual, with their annual results, English Electric have given a good start to the electrical equipment market's season of reports and dividends.

A.E.I. Results

The new ordinary shares issued last month by Associated Electrical Industries do not rank for the final dividend of 12½ per cent (making again a total of 20 per cent) declared for 1951, but will be entitled to payments on account of the current year onwards. Preliminary profit figures accompanying the declaration go to support the company's view, expressed at the time of the issue, that the increase in capital is not likely to affect the rate of dividend. Group trading profit, at over £10¼ million, has expanded by more than 20 per cent, and although the net figure (after taxation of £5·4 million) comes out only moderately higher at £2⅛ million, the figure is arrived at after substantially increased provisions. Following upon the company's announcement, the old ordinary shares were quoted at 72s, cum-dividend worth 1s 4d net, and the new shares at 69s 9d. The latter will be dealt in free of transfer stamp until the end of March, so that they are the cheaper investment on that basis. The yield is just on 5¾ per cent.

Recent Issues

On Imperial Chemical Industries new ordinary shares, the premium fell away to three half-pence on the issue price of 40s 6d. A factor in this case was the deferment of the Budget date from 4th to 11th March, for acceptances, with a first call of 20s per share, fell due to-day, 7th March. Buyers of the "rights" had originally a cheap option over market reactions to the Budget, so that the postponement upset a popular speculative exercise. It also left genuine shareholders in something of a dilemma. Automatic Telephone new ordinary shares were relatively well maintained at 28s 3d premium on the offered price of 45s.

Radio News

With the effects of other recent "rights" issues very much in evidence around the industrial markets, it was more or less inevitable that Decca Record's capital announcement should be the signal for marking down the company's 1s ordinary shares. They were quoted at 15s after deduction of the rights (valued at 1s per old share) to subscribe for one new share at 4s 6d for every ten held. An issue in the same proportions was made at 5s a year ago. E. K. Cole 5s shares were steady at about 15s in advance of the interim dividend. A 25 per cent share bonus has been distributed since last year's interim of 10 and final of 15 per cent. The total was equivalent to 20 per cent on the present capital, but it was in the highly conservative class and hopes had been entertained that this year's interim would indicate the intention to keep the annual rate of 25 per cent. There has been some revival of interest in Ultra Electric 5s shares at around 5s 9d in connection with the results to come for the year ending this month.

The Month's Changes

It will be noticed from the list of prices overleaf that since a month ago the falls have been fairly heavy in a number of cases. In one or two instances prices are quoted ex rights to new issues; but, allowing for these, some of the declines are still widespread and substantial. Amongst the exceptions, Aron are better at 36s 3d and so are International Combustion, 21s 3d, De la Rue, 31s 3d, Burco, 20s 9d and Telegraph Condenser, 46s. Against these advances, there are nearly two dozen falls.

Electrical Investments

Past Month's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price Feb. 29 1952	Month's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Overseas Electricity Companies							
Atlas Elec. ..	3	4	18/-	−1/-	4	9	0
Calcutta Elec. ..	6†	6†	20/-	−6d	6	0	0†
Cawnpore Elec. ..	—	—	27/6	−¼		—	
East African Power	7	7	31/3	−6d	4	9	7
Jerusalem Elec. ..	—	—	9/6	−6d		Nil	
Madras Elec. ..	—	—	23/9	−¼		—	
Nigerian Elec. ..	10	10	26/6	−1/6	7	11	0
Palestine Elec. "A"	5†	5†	15/6	−6d	6	9	0†
Perak Hydro-Elec.	Nil	Nil	12/6	—		—	
Equipment and Manufacturing							
AberdareCables(5/-)	20	20	11/9	−9d	8	10	2
Aerialite (1/-) ..	83½	88½	8/9	—	10	2	0
Aron Elec. Ord. ..	15	15	36/3	+½	8	5	4
Assoc. Elec. Ord.	15	20	72/6	—	5	10	4
AutomaticTel.& El.	12½	15	54/-	−2/3	5	11	1
Babcock & Wilcox	15	18	65/3	−½	5	10	5
Baldwin, H. J. (2/-)	25	25	5/-	—	10	0	0
British Aluminium	10	10	34/9	−2/-	5	15	0
B.I. Callender's ..	6¾	7½	27/-	−1/-	5	11	1
British Thermostat (5/-)	30	30	27/6	—	5	9	1
British Vac.Cleaner (5/-)	20	25	14/-	—	8	18	6
Brush Ord. (5/-) ..	10	10	5/3	−9d	9	10	6
Burco (5/-) ..	42½	38¾	20/9	+9d	9	6	8
Chloride El.Storage	12½	15	58/9	—	5	2	0
Cole, E. K. (5/-) ..	20	25	15/-	−1/-	6	13	4*
Cossor, A. C. (5/-)	Nil	Nil	10/9	−1/9		—	
Crabtree (10/-) ..	17½	17½	33/-	—	5	6	1
Crompton Parkinson Ord. (5/-) ..	22½	11¼*	8/9	−6d	6	8	3
De La Rue (5/-) ..	50	50	31/3	+⅛	8	0	0
Decca (1/-) ..	112½	112½	16/-	—	7	0	8
E.M.I. (10/-) ..	8	12	15/3	−⅛	7	18	8
Electrical Components (5/-) ..	20	20	11/3	—	8	17	10
Elec. Construction	15	15	50/-	—	6	0	0
Enfield Cable Ord.	7½	7½	26/-	—	5	15	5
English Electric ..	10	15	55/-	−½	5	9	0
Ericsson Tel. (5/-)	20†	22†*	37/6	−⅛	2	18	8†
Ever Ready (5/-)	35	35	25/6	−1/-	6	17	3
Falk Stadelmann	15	15	40/-	—	7	10	0
G.E.C. Ord. ..	17½	22½	73/-	—	6	3	3
General Cables (5/-)	38	30⅝	17/6	—	8	11	6
Greenwood &Batley	15	15	46/3	−⅛	6	10	0
Hackbridge Cable (5/-)	20	20	9/9	−6d	10	5	2
HackbridgeHewittic (5/-)	15	18	15/-	−½	6	0	0
Hall Tel. Acc. (10/-)	10	10	12/-	—	8	6	8
Heatrae (2/-) ..	12½	12½	4/-	—	6	5	0
Henleys (5/-) ..	20	20	18/-	−1/6	5	11	1
Hoover (5/-) ..	30	35*	25/9	+6d	6	16	0
Intl. Combustion (5/-)	20	25*	21/3	+2/-	5	17	8
Johnson & Phillips	15	15	48/9	−2/-	6	3	0

Company	Dividend Previous	Dividend Last	Middle Price Feb. 29 1952	Month's Rise or Fall	Est. Yield s	Est. Yield d
Equipment and Manufacturing (continued)						
Lancashire Dynamo	22½	22½	40/-	−9d	12	6*
Laurence;Scott(5/-)	12½	12½	11/9	—	6	5
London Elec. Wire	10	10	38/9	−⅛	5	3
J. Lucas	17½	7½*	32/6	—	12	4
Mather & Platt ..	11	12½	40/9	—	5	6
Metal Industries ..	10	10	35/9	—	11	9
Mid. Elec. Mfg. ..	12½	15	60/-	—	7	0
Murex	10	12½	46/-	−5/6	8	8
Newman Ind. (2/-)	10	6	2/9	—		—
Oldham & Son (1/-)	30	30	3/9	−3d	8	0
Parsons, C. A. ..	15	15	45/9	—	5	6*
Plessey (5/-) ..	20	22½	18/3	−9d	6	3
Pye Deferred (5/-)	35	18*	17/-	—	5	6
Revo (10/-) ..	27½	27½	32/6	−6/3	8	9
Reyrolle	15	15	40/9	−⅛	7	7
Scot. Cable (4/-) ..	30	30	20/3	—	5	18
Siemens Ord. ..	7½	10	32/-	−4/3	6	5
Switchgear&Cowans (5/-)	20	22½	13/6	—	8	6
T.C.C. (10/-) ..	15	20	46/-	+1/-	4	7
T.C. & M.	9*	10*	35/-	−⅛	5	14
TelephoneMfg.(5/-)	10	10	7/6	−1/-	6	13
Thorn Elec. (5/-)..	20	10*	8/3	−9d	6	3
Tube Investments	25	25	5	−¼	6	5
Vactric (5/-) ..	Nil	Nil	5/-	−⅛		—
Veritys (5/-) ..	2½	Nil	3/6	−3d		Nil
Walsall Conduits (4/-)	70	70	48/9	−⅛	6	0
Ward & Goldstone (5/-)	44	45*	36/3	−5/3	6	0
Watford (2/-) ..	20	25	5/9	−3d	8	13
WestinghouseBrake	14	14	46/3	−⅛	6	1
West, Allen (5/-)..	10	12½	9/9	−1/-	6	8
Transport and Communications						
Anglo-Am. Tel.: A Ord.	—	—	85	−2½		—
Ord.	—	—	60	—		—
Anglo-Portuguese	8	8	21/3	−⅛	7	10
Brit. Elec. Traction: Def. Ord. ..	22½	25	375	−30	6	13
Cable & Wireless: Ord.	6	8	119½	−5½	6	14
4% Loan ..	4	4	94½	−½	4	4
Calcutta Trams ..	6†	6†	23/-	−1/6	5	4
Cape Elec. Trams	4	5	15/-	—	6	13
Globe Tel. & Tel. Ord.	—	—	26/6	—	5	5
Great Northern Tel. (£10)	7½	8	10	—	8	0
Inter. Tel. & Tel.	Nil	15cts	31	−4		—
Marconi Marine ..	7½	10	31/3	−4/9	6	8
Oriental Tel. Ord.	16	16	44/6	+9d		—
Telephone Props.	7	8	28/9	−½	5	11
Tele. Rentals (5/-)	10	10	7/9	−⅛	6	9

* After capital bonus.
† Dividends are paid free of Income Tax.

NEXT WEEK'S EVENTS

Monday, 10th March

BELFAST.—Queen's University, 6.15 p.m. I.E.E. Northern Ireland Centre. "The Economic Use of Small Sources of Water Power," by Lt.-Col. J. R. W. Murland. (Joint meeting with the Northern Ireland Association of the I.C.E.)

BIRMINGHAM.—Imperial Hotel, Temple Street, 6 p.m. I.E.E. South Midland Supply & Utilization Group. "Electricity Supply—A Statistical Approach to Some Particular Problems," by R. B. Rowson.

BRISTOL.—S.W.E.B. Offices, Colston Avenue, 6 p.m. I.E.E. Western Centre. "The Control of Hydro-Electric Plant," by A. C. H. Frost and W. Britt Bebank.

KINGSBURY.—Prince of Wales Hotel, Kingsbury Road, N.W.9, 7.45 p.m. A.S.E.E. North West London Branch. "Automatic Power Factor Correction," by J. Orr.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Informal meeting. Discussion on "Remote Measurement and Instrumentation," opened by H. Horwood.

St. Ermin's Hotel, Caxton Street, S.W.1, 7 p.m. A.S.E.E. Central London Branch. "Maintenance and Repair of Electrical Motors," by D. R. Reekie.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "The Economics of Low-Voltage Electricity Supplies to New Housing Estates," by F. G. Copland.

Tuesday, 11th March

BOLTON.—Balmoral Hotel, Bradshawgate, 7 p.m. A.S.E.E. Bolton Branch. Business meeting and lecture.

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio Group. "An Investigation into the Mechanism of Magnetic-Tape Recording," by P. E. Axon.

DERBY.—E.M.E.B. Service Centre, 6.30 p.m. I.E.E. East Midland Centre. "The Determination of Time and Frequency," by H. M. Smith.

LONDON.—At the Institution of Electrical Engineers, Savoy Place, W.C.2, 5 p.m. Institution of Post Office Electrical Engineers. "The Control of External Major Works," by E. A. Scholey.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6 p.m. Illuminating Engineering Society. "Lighting in Shipyards," by J. S. McCulloch.

Savoy Hotel, W.C.2, 7.15 p.m. Institution of Heating and Ventilating Engineers. Annual dinner. (Postponed from 13th February.)

MANCHESTER.—Midland Hotel, 6.45 for 7.15 p.m. I.E.E. North-Western Centre. Annual dinner and visit of President.

NEWCASTLE-ON-TYNE.—City Hall, 7 p.m. I.E.E. North-Eastern Centre. Faraday Lecture on "Sound Recording—Home, Professional, Industrial and Scientific Applications," by Dr. G. F. Dutton.

NEWPORT.—Tredegar Arms Hotel, 7 p.m. Newport & District Electric Club. "Application of Capacitors for Industrial Power Factor Correction," by H. A. Jones.

WIMBLEDON.—St. George's Hall, St. George's Road, 8.15 p.m. A.S.E.E. South West London Branch. "Voltage Regulators," by E. M. Pendrill.

Wednesday, 12th March

ABERDEEN.—Caledonian Hotel, Union Terrace, 7.30 p.m. I.E.E. North-East Scotland Sub-Centre. Informal paper by W. M. L. Hill.

BARNSLEY.—Town Hall, 7 p.m. I.E.E. North Midland Centre. "A Review of Research in Electricity Supply," by C. W. Marshall. (Joint meeting with the Sheffield Sub-Centre.)

BIRMINGHAM.—Chamber of Commerce, New Street, 7 p.m. A.S.E.E. Birmingham Branch. "Installation Practice," by W. J. Parker.

BRIGHTON.—S.E.E.B. Showrooms, 6.30 p.m. I.E.E. Southern Centre. "The Influence of Rectifier Harmonics in a Railway System on the Dielectric Stability of 33 kV Cables," by S. B. Warder, Dr. Ing. E. Friedlander and Dr. A. N. Arman.

EDINBURGH.—Heriot-Watt College, 7 p.m. I.E.E. Scottish Centre. "The Dimming of Low-Pressure Discharge Lamps," by C. E. Williams.

Welfare Club Hall, City Lighting & Cleansing Department, 357, High Street, 7 p.m. I.E.S. Edinburgh Centre. Short papers and annual general meeting.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. "The Slot Aerial and its Application to Aircraft," and "A Survey of External and Suppressed Aircraft Aerials for Use in the High-Frequency Band," by R. H. J. Cary.

At the Institution of Civil Engineers, Great George Street, S.W.1, 6.30 p.m. I.E.E. London Students' Section. Debate on "The Railways no longer fulfil the Inter-urban and Industrial Transport Requirements of this Country and must be converted to Trunk Roads and Aerodromes." (Joint meeting with the Association of London Students of the I.C.E. and London Graduates' Section of I.Mech.E.)

OXFORD.—S.E.B. Showrooms, 37, George Street, 7 p.m. Institution of Electrical Engineers. District meeting. "High Voltage Insulators," by G. H. Dirie.

PRESTON.—Harris Institute, Corporation Street, 7 p.m. I.E.E. North Lancashire Sub-Centre. "Domestic Electrical Installations: Some Safety Aspects," by H. W. Swann.

WOOD GREEN.—Three Jolly Butchers Hotel, 8.15 p.m. A.S.E.E. North London Branch. Address by Mr. H. E. J. Butler.

Thursday, 13th March

DUNDEE.—Royal Hotel, Union Street, 7 p.m. I.E.E. North-East Scotland Sub-Centre. Informal paper by W. M. L. Hill.

LEEDS.—Town Hall, 7 p.m. I.E.E. North Midland Centre. Faraday Lecture. "Sound Recording—Home, Professional, Industrial and Scientific Applications," by Dr. G. F. Dutton.

B.E.A. Yorks Division Offices, 1, Whitehall Road. E.P.E.A. West Yorkshire Technical Group. "Power Stations Past and Present," by F. W. Lawton.

[*Continued on next page*

LEICESTER.—E.M.E.B., Charles Street, 6.30 p.m. I.E.S. Leicester Centre. "Sports Lighting," by M. W. Peirce.

LIVERPOOL.—Electricity Showroom, Whitechapel, 7 p.m. E.P.E.A. Merseyside Technical Group. "Centralized Control with particular reference to Automatic Boiler Control," by J. S. Holt.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Extra meeting. "Electronic Telephone Exchanges," by T. H. Flowers.

Caxton Hall, S.W.1, 6 p.m. Engineers' Guild. Discussion on "The Problem of the Over 40's," introduced by L. N. Duguid.

MANCHESTER.—Town Hall Extension, 6 p.m. I.E.S. Manchester Centre. "The Performance of Vehicle Headlights on Roads," by A. G. Harris.

Friday, 14th March

BIRMINGHAM.—Imperial Hotel, Temple Street, 6 p.m. I.E.S. Birmingham Centre. Annual general meeting. "The Physical Principles Governing Fittings Design," by W. H. Willott.

CREWE.—Crewe Arms Hotel, 7.30 p.m. A.S.E.E. Crewe Branch. "Factory Electrical Maintenance," by C. Maddocks.

LIVERPOOL.—Laboratories of Applied Electricity, Brownlow Street, 7.30 p.m. A.S.E.E. Liverpool Branch. "The Cathode Ray Oscillograph as a Tool," by R. C. Turnock. (Postponed from 7th March.)

LONDON.—Connaught Rooms, Great Queen Street, 12.45 for 1.15 p.m. British Refrigeration Association. Annual luncheon.

Connaught Rooms, Great Queen Street, W.C.2, 6.15 for 6.45 p.m. Junior Institution of Engineers. Annual dinner.

Feathers Hotel, Broadway, S.W.1. Electrical Trades Commercial Travellers' Association. General meeting.

MANCHESTER.—Grand Hotel. Manchester Association of Engineers. Dinner and dance.

NOTTINGHAM.—Electricity Showrooms, Smithy Row, 7.30 p.m. A.S.E.E. Nottingham Branch. "Auto Electrical Equipment," by F. Bull.

STAFFORD.—Royal Oak Hotel, 7 for 7.30 p.m. I.E.E. North Staffordshire Sub-Centre. Annual dinner.

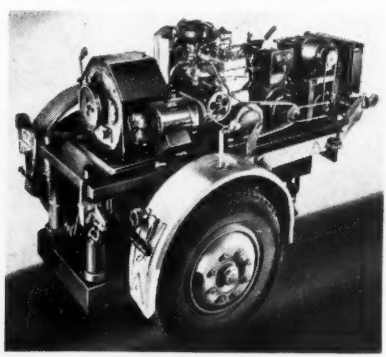
Saturday, 15th March

OXFORD.—S.E.B., George Street, 3 p.m. A.S.E.E. Oxford Branch. "Television."

Road Testing Equipment

FOR many years a programme of research on bitumen has been carried out at the three main Shell research centres at Amsterdam, Holland; Thornton, England; and Emeryville, U.S.A. Since the war, as part of this programme, work has been done at Amsterdam on the elastic, or resilient, properties of road materials. It is generally recognized that moving traffic sets up vibrations in a road but until now, little has been known about the influence of these vibrations on the strength of the road or to what extent they form a limiting factor. To meet this problem a non-destructive dynamic road testing machine has been produced in which a vertical alternating sinusoidal force of up to 2,000 kg is generated by revolving eccentric masses and applied to the road. The vibrations thus excited are picked up by microphones placed on the road surface and measured by means of an electronic voltmeter and a vibration recorder coupled to a cathode ray oscilloscope. The generator operates over the range 5 to 60 c/s, thus covering the most important frequencies imposed by traffic. The rates of propagation of the vibrations through the road are measured and the dynamic shear moduli of the various construction layers determined. By measuring the deformations which the road undergoes under a known alternating force, the stresses and strains set up in the road carpet can be derived.

Shell road testing machine on trailer



The testing apparatus is easily moved about, since the vibrating and balance weights are mounted on a two-wheeled trailer which is towed by a van containing the recording instruments.

Educational

Two lectures on "The Properties of the Ferraris Disc" will be given by Prof. P. Harmegries on 10th and 13th March, at 5.30 p.m., at King's College, Strand, London, W.C.2. Admission is free.

NEW PATENTS

Electrical Specifications Recently Published

numbers under which the specifications will be printed and abridged are given in parentheses. Copies of specification (2s 8d each including postage) will be obtainable after 16th April from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

185 Colborne, R. H.—Interconnection of glass parts especially applicable to the manufacture of glass envelopes for electron-discharge devices. 1st May, 1947. (670411.)

1947

102 Bertele, H. C.—Metal-vapour electric discharge apparatus. 16th April, 1948. (670416.) 10572.—Starting and control arrangements for electric discharge apparatus. 19th April, 1948. (670417.)

129 British Thomson-Houston Co., Ltd.—Antennae. 13th May, 1947. (670231.)

1788 British Thomson-Houston Co., Ltd.—Cathodes for electric discharge devices. 7th July, 1947. (670420.)

1948

5151. Siemens Electric Lamps & Supplies, Ltd., and Cumming, H. W. L.—Electric discharge lamps. 18th February, 1949. (670234.)

7698. Ratcliffe, S.—Automatic frequency control circuit arrangements. 11th April, 1949. (670238.)

10153. Compagnie Générale de Télégraphie sans Fil.—Electron lens arrangements. 12th April, 1948. (670318.)

11072. Boujours, L. M. Barbe-.—Process of electric welding. 22nd April, 1948. (670321.)

12942/3. Schonander, G.—Röntgen apparatus. 11th May, 1948. (670239/0.)

14498. British Thomson-Houston Co., Ltd.—Electric discharge tubes. 28th May, 1948. (670241.)

23736. Ryba, A.—Electro-magnetic pumping devices for liquids and gases. 9th September, 1948. (Cognate applications 23738, 28th February, 1948, 23739, 28th February, 1948, and 23741, 24th April, 1948.) (670327.)

24411. Standard Telephones & Cables, Ltd.—Transverse travelling wave amplifier. 17th September, 1948. (670248.)

24479. Augier de Montgremier, P.—Magnetic amplifiers. 17th September, 1948. (Convention date not granted.) (670081.)

25004. Standard Telephones & Cables, Ltd. (Veaux, H. M.).—Multiplex system for telegraph transmission. 24th September, 1948. (670082.)

25505. Holophane, Ltd. (Holophane Co., Inc., and Soc. Anon. Holophane).—Lighting systems. 30th September, 1948. (670331.)

26286. Standard Telephones & Cables, Ltd.—Automatic switching system applicable to telephony. 8th October, 1948. (670251.)

26574. Holophane, Ltd. (Holophane Co., Inc.).—Luminairs and lighting systems using the same. 12th October, 1948. (670332.)

27118. Standard Telephones & Cables, Ltd.—Switching system comprising multi-switches for establishing one or more connections in line finder and final selector stages. 19th October, 1948. (670252.)

29416. Westinghouse Brake & Signal Co., Ltd., Peter, L. H., Jenkins, A., and Garrod, K. A.—Electrically conducting devices having a non-linear characteristic. 12th October, 1949. (670421.)

31799. Krefft, H. E.—Electrical discharge lamp structures. 8th December, 1948. (670256.)

32402. Standard Telephones & Cables, Ltd., and Beck, A. H. W.—Frequency modulated electron velocity modulation apparatus. 15th December, 1948. (670257.)

33226. Standard Telephones & Cables, Ltd.—Velocity modulation tubes. 24th December, 1948. (670259.)

1949

856. Standard Telephones & Cables, Ltd.—Radio navigation systems. 6th January, 1950. (670338.)

2105. National Research Development Corporation.—Electric wave attenuators and the like. 24th January, 1950. (670339.)

2140. Compagnie Générale d'Electricité.—Oil filled electric cables. 26th January, 1949. (670093.)

2352. Electric & Musical Industries, Ltd.—High-frequency aerials. 30th January, 1950. (670340.)

3148. Telefonaktiebolaget L. M. Ericsson.—Audio-frequency signalling arrangements for automatic telephone systems. 4th February, 1949. (670095.)

3595. Soc. Lignes Telegraphiques et Telephoniques.—Magnetic windings for the loading of electric conductors. 9th February, 1949. (670267.)

3622. Automatic Telephone & Electric Co., Ltd.—Automatic switches for use in telephone or like systems. 31st January, 1950. (670096.)

4242. English Electric Co., Ltd.—Engine driven electric generating plant for rail vehicles. 8th February, 1950. (670270.)

4747. Colborne, R. H.—Manufacture of cathode-ray tubes. 1st May, 1947. (670430.)

5062. Pye, Ltd., and Court, P. R. J.—Magnetic focusing device for cathode-ray tubes. 20th February, 1950. (670431.)

6607. Grey, J. A.—Electric warming plates. 11th December, 1950. (670278.)

8907. Standard Telephones & Cables, Ltd.—Selector switch brushes. 1st April, 1949. (670347.)

10481. Automatic Electric Laboratories, Inc.—Ticket-issuing machine. 20th April, 1949. (670286.)

11131. Birlec, Ltd., and May, E.—High-frequency electric induction heaters or furnaces. 27th July, 1950. (670099.)

11244. Camp, E. J., and Moore, H. R.—Electric stills. 18th April, 1950. (670439.)

13691. Zenith Radio Corporation.—Television transmitters. 23rd May, 1949. (670442.)

13692. Zenith Radio Corporation.—Television receivers. 23rd May, 1949. (670443.)

14126. British Thomson-Houston Co., Ltd.—Dynamo-electric machine windings. 26th May, 1949. (670105.)

14259. General Electric Co., Ltd., Higgins, C., and Miles, E. E.—Tubular electric discharge devices, especially cold cathode discharge lamps. 26th May, 1950. (670292.)

14634. Metropolitan-Vickers Electrical Co., Ltd.—Steam turbine plant. 26th May, 1950. (670295.)

15599. Electric & Musical Industries, Ltd.—Voltage stabilizing arrangements. 2nd June, 1950. (670298.)

17130. National Research Development Corporation.—Calling arrangements for telecommunication systems. 12th June, 1950. (670358.)

17212. British Thomson-Houston Co., Ltd.—Electric lamps and similar devices. 29th June, 1949. (670201.)

17378. Sylvania Electric Products, Inc.—Thermionic discharge device. 30th June, 1949. (670112.)

17588. British Insulated Callender's Cables, Ltd., Dixon, H. J., Chapman, J. E. G., and Gauterin, A. G.—Multiple-pin, two-part electric couplings. 3rd July, 1950. (Cognate application 30890, 1st December, 1949.) (670113.)

17897. Marconi's Wireless Telegraph Co., Ltd.—Two-way radio communication stations. 28th March, 1950. (670302.)

18342. Heenan & Froude, Ltd., and Coney, E. C.—Driving mechanisms for electric cranes. 11th July, 1950. (670303.)

19722. Crossland, Ltd., R. & A. G., and Cocksedge, F. M.—Electric lamp housings. 23rd June, 1950. (670205.)

20026. British Broadcasting Corporation, and Fitzgerald, J. A.—Frequency-divider circuits. 14th July, 1950. (670363.)

20145. Henniker, R. C.—Adjustable inductive electric windings and contact devices therefor. 1st November, 1950. (670305.)

20821. Radio Corporation of America.—Electron-discharge devices and associated circuits. 10th August, 1949. (670121.)

20835. Metropolitan-Vickers Electrical Co., Ltd.—Electrostatic clutches. 23rd June, 1950. (670208.)

21180. General Electric Co., Ltd.—Electric-pulse code modulation signalling systems. 8th August, 1950. (670369.)

21400. International Business Machines Corporation.—Electrical connector. 17th August, 1949. (670308.)

21616. General Electric Co., Ltd., and Watkins, T. B.—Thermionic valve oscillators adapted to be frequency modulated. 17th August, 1950. (670123.)

23028. Philips Electrical, Ltd.—Travelling-wave electronic discharge tubes. 6th September, 1949. (670124.)

23894. Ewart Catering Equipment, Ltd., and Wallis, B. H.—Electric water heaters. 8th September, 1950. (670126.)

24750. Philips Electrical, Ltd.—Electric discharge tubes. 27th September, 1949. (670129.)

26529. Electricité de France.—Devices for operating and controlling high-tension electrical apparatus. 15th October, 1949. (Cognate applications 26530, 21st January, 1949, and 26531, 13th September, 1949.) (670139.)

26588. Philips Electrical, Ltd.—Roller seam welding apparatus. 17th October, 1949. (670376.)

27574. British Thomson-Houston Co., Ltd.—Vacuum cleaners. 27th October, 1949. (670219.)

29081. British Thomson-Houston Co., Ltd.—Curve followers. 14th November, 1949. (670143.)

29363. Marconi's Wireless Telegraph Co., Ltd.—Radar systems. 31st July, 1950. (670383.)

29927. Automatic Telephone & Electric Co., Ltd.—Loud-speaking telephone equipment. 9th November, 1950. (670061.)

30724. English Electric Co., Ltd.—High-frequency induction heating apparatus. 22nd November, 1950. (670148.)

31693. General Electric Co., Ltd., Manners, M., and Partridge, J. H.—Lamps for emitting ultra-violet radiation. 22nd November, 1950. (670387.)

31711. Carr Fastener Co., Ltd.—Electrical contact members for holders for thermionic valves, electrical plugs and like electrical devices having projecting pins. 31st October, 1950. (670477.)

31803. Pirelli-General Cable Works, Ltd., and Arman, A. N.—Manufacture of pipes, conduits, electric cable sheaths and the like. 6th October, 1950. (670064.)

31811. British Insulated Callender's Cables, Ltd., Baker, H. A., and Glick, D.—Sealing terminations for metal-sheathed electric cables. 12th December, 1950. (670388.)

31891. Self-Priming Pump & Engineering Co., Ltd., Meredew, G. C., and Stevens, G. C.—Electric motor driven pumps. 24th May, 1950. (670226.)

32346. Philips Electrical, Ltd.—Braun tubes for use in television receivers. 16th December, 1949. (670152.)

32475. Triggs, W. W. (National Battery Co.).—Electric storage battery. 19th December, 1949. (670066.)

32765. General Electric Co., Ltd., Espley, D. C., and Gledhill, G. A.—Apparatus for the measurement of phase distortion in electrical circuits. 8th December, 1950. (670391.)

33117. British Insulated Callender's Construction Co., Ltd., and Gibson, J. N.—Apparatus for use in the drawing of electric cables into trenches. 28th December, 1950. (670158.)

1950

4306. British Thomson-Houston Co., Ltd. (Metal Electric Co.).—Trolley-collectors for electric bus-bar conduct systems. 20th February, 1950. (669714.)

4444. Sangamo Weston, Ltd.—Induction galvanometers. 21st February, 1950. (669715.)

4553. Philips Electrical Industries, Ltd.—Electric discharge tubes. 22nd February, 1950. (669716.)

4566. British Thomson-Houston Co., Ltd.—Frequency-modulation circuits. 22nd February, 1950. (6697)

6617. Radio Corporation of America.—Semi-conductor amplifier and rectifier. 16th March, 1950. (669729)

9153. Telefonaktiebolaget L. M. Ericsson.—Electro-acoustic transducers. 13th April, 1950. (669883.)

10035. British Thomson-Houston Co., Ltd.—Electric discharge lamps. 24th April, 1950. (669888.)

11088. Lincoln Electric Co.—Methods of and apparatus for welding. 4th May, 1950. (669890.)

12217. Vereinigte Osterreichische Eisen-U Stahlwerke Akt.-Ges.—Roller bed roller with individual electric motor drive, in particular for rolling mills. 16th May, 1950. (669726.)

13213. British Thomson-Houston Co., Ltd.—Frequency modulation detector circuits. 25th May, 1950. (669965.)

22272. Levy, S. J.—Mobile electric water-heater. 11th September, 1950. (669803.)

23092. Young, S. G.—Manufacture of snapper members in electric snap-action switches. 20th September, 1950. (669969.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 20th March.

UNIONMELT. No. 671,740, Class 7 and No. 671,741, Class 9. Electric welding machines, apparatus and parts.—Linde Air Products Co., New York, U.S.A. Address for service, c/o Reddie & Grose, 6, Bream's Buildings, London, E.C.4.

RED ROSE PRODUCT (design). No. 701,221, Class 7. RED ROSE CATHOWELD (design). No. 701,223, Class 7. Portable electric welding machines and parts and fittings. RED ROSE PRODUCT (design). No. 701,222, Class 9. Portable electrical appliances and parts and fittings, all included in Class 9.—G. K. Lancaster (London), Ltd., 50, George Street, Croydon, Surrey.

TECNICO. No. B690,029, Class 9. Electric vacuum cleaners and parts included in Class 9, and radio receiving apparatus.—Tecnico, Ltd., Marrickville, N.S.W., Australia. Address for service, c/o Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

E F (design). No. B694,434, Class 9. Electrical apparatus and instruments included in Class 9; surveying, signalling, indicating and inspecting apparatus and instruments; and thermostatic controlling apparatus and instruments included in Class 9. E F (design). No. B694,435, Class 11. Installations for lighting, heating, drying and ventilating; and parts included in Class 11.—Hilda Bader, trading as Elektro-Funditor Bader & Cie., Baden, Germany. Address for service, c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, London, W.C.2.

APOLLO (design). No. 702,867, Class 9. Radiogramophones, wireless and television sets, etc., all sold complete.—J. B. Manufacturing Co. (Cabinets), Ltd., 86, Palmerston Road, Walthamstow, E.17.

MYRIAMEG. No. B703,215, Class 9. Ohmmeters.—Electronic Instruments, Ltd., 17, Paradise Road, Richmond, Surrey.

LIMPET. No. B703,416, Class 9.—Electromagnetic attachments being devices for holding portable instruments to workpieces to be tested.—Cabul Tool Co., Ltd., 46-48, Battersea Bridge Road, London, S.W.11.

HYGINARE. No. 703,007, Class 10. Apparatus embodying one or more ultra-violet ray lamps for medical, surgical, dental or veterinary purposes.—Perihel, Ltd., 17, Edge Street, London, W.8.

ORBIT. No. 702,155, Class 11. Electric fans.—Veritys, Ltd., Plume Works, Plume Street, Aston, Birmingham, 6.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Bristol.—14th March. City Council. Supply of electric lamps and batteries. Central Purchasing Department, Upper York Street, St. Paul's.

Egypt.—CAIRO.—Cairo Electricity & Gas Administration. The latest date for receipt of tenders for the supply of 110 power transformers (advertised in our issue of 22nd February), has been postponed to 20th March. (See this issue.)

Hornchurch.—17th March. U.D.C. Street lighting equipment. (See this issue.)

Hull.—19th March. City Council. Electrical installation in Barham Modern School for Girls, Bilton Grange. City architect, Guildhall.

Newark.—31st March. Corporation. Street lighting equipment. (See this issue.)

Persia.—TEHERAN.—30th March. Ministry of Posts, Telegraphs and Telephones. Electrical equipment for Teheran radio station. (C.R.E. 1658/52. Ten/3647.)*

Romford.—24th March. Corporation. Street lighting equipment. (See this issue.)

Uruguay.—MONTEVIDEO.—24th April. Ferrocarril Central del Uruguay. 6,000 1.5 V dry batteries for telegraphic and telephonic use; 3,000 1.5 V dry batteries for use in hand lanterns. (C.R.E. 1788/52. Ten/3668.)*

Warwick.—31st March. Corporation. Street lighting equipment. (See this issue.)

ORDERS PLACED

Houghton-le-Spring (Durham).—U.D.C. Electrical installations in 140 new houses.—B. L. Oliver (Birtley).

Middlesbrough. — Education Committee. Electrical work for stage two of the Stainsby Secondary School scheme (£16,046).—Steels Engineering Installations (Sunderland).

Newcastle-on-Tyne.—Education Committee. Electrical installation at Stocksfield Avenue Primary School (£5,568).—Devereux Moodie & Co., Ltd. Electrical installation at the new Denton Square Primary School (£6,552).—R. V. Hogg & Co.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldridge.—Houses (44), Sundial estate, Great Barr; surveyor, Urban Council Offices, Aldridge, near Walsall.

Ashton-in-Makerfield. — Houses (58), Laudgate Lane; borough surveyor.

Aycliffe (Co. Durham).—Offices and administrative block at Aycliffe Hospital for the Regional Hospital Board, "Dunira," Osborne Road, Newcastle-on-Tyne.

Billingham-on-Tees.—Houses (22), Roseberry Road; Kitching & Co., architects, 21, Albert Road, Middlesbrough.

Bilston.—Houses (138), Bradley; W. G. Lofthouse, architect.

Birmingham. — Multi-storey flats (216 dwellings), Aston Hall Road, Aston; city engineer, Civic Centre.

Blackrod.—Houses (30), for U.D.C.; J. C. Prestwich & Sons, architects, Bradshawgate Chambers, Leigh.

Blaydon-on-Tyne.—Additions to Normans Riding Hospital for the Regional Hospital Board (£17,000); Shield Brothers, builders, Swalwell, Co. Durham.

Caernarvonshire.—Adaptations at mansion and coach block, Glynllifan (£28,000); Roberts & Rowlands, Ltd., 14a, Pool Side, Caernarvon.

Carlisle.—Houses (34), Harraby, for City Council; J. F. Johnston, builder, Carlisle (22); and J. H. Graham, builder, Carlisle (12).

Carlton.—Dwellings (52), Thoresby Avenue and Cavendish Road sites; J. R. Campbell, U.D.C. surveyor, Council House, Burton Road.

Chapel-en-le-Frith.—Dwellings (62), Dove Holes, Peak Dale and Hope sites; R.D.C. surveyor, 27, Market Street.

Chesterfield.—Junior school; borough architect.

Colwyn Bay.—Houses (26), Llysfaen Road; Gorst Bros., Fairfield, Sea Road, Abergele.

Crewe.—Houses (78), Wistaston Green estate; city engineer.

Cumberland.—Secondary school, Penrith; additional classrooms at Westfield School, Workington; and adaptations at Eden Secondary School, Carlisle; county architect, Carlisle.

Doncaster.—Extensions, including maternity annexe, at Royal Infirmary; secretary, Sheffield Regional Hospital Board, Fulwood House, Old Fulwood Road, Sheffield.

Douglas (I.O.M.).—Houses (160), Willaston estate; borough engineer.

Feltham.—Crematorium (£49,909) for the South West Middlesex Crematorium Board; W. Willett, Ltd., builders, Sloane Square, London, S.W.1.

Filey.—Printing works, Muston Road estate; Filey Printers, Ltd.

Gosport.—Houses (38), in nine blocks, Walpole Park; borough surveyor, Town Hall.

Hastings.—Dwellings (122), Harley Shute estate; borough surveyor, Wellington Square.

Hebburn-on-Tyne.—Houses (80) on Hartleyburn site for the U.D.C.; W. Leech, Ltd., builders, 2, Clayton Street, Newcastle-on-Tyne.

Hemsworth.—Houses (84), in eight parishes; S Price, R.D.C. surveyor, Brierley Hall, Brierley, Barnsley.

Hornsey.—Shops (10) with 18 flats, Park Road; G. A. Pentecost, borough surveyor, Town Hall, Broadway, N.8

Hyde.—Houses (50), Cheetham Fold estate; borough surveyor.

Jarrow-on-Tyne.—Tuberculosis department at Prudhoe and Monkton Hospital; P. H. Knighton, architect to the Hospital Board, "Dunira," Osborne Road, Newcastle-on-Tyne.

R.C. junior mixed and infants' school, Alnwick Grove; R. Burke, architect, Lambton Road, Newcastle-on-Tyne.

Keynsham.—Houses (48), Park Road estate; U.D.C. surveyor, Council Offices, Keynsham, Bristol.

Lanchester (Co. Durham).—Houses (200) and shopping centre at Hamsteels; surveyor, R.D.C. Offices, Lanchester.

Leamington Spa.—Flats (24), Tachbrook Road; Edgar Crowder, Ltd., South Road, Birmingham.

Leeds.—Houses (200), Moorside estate; city architect.

Lincoln.—Secondary modern school, Tattershall; D. C. Hall, architect, 6, Mason's Yard, Duke Street, S.W.1.

Liverpool. — Children's homes at Speke, Croxeth, Deysbrook Lane and Sparrow Hall estates; city architect.

London.—CANNING TOWN.—Medical centre and offices; National Dock Labour Board, 9, Upper Brook Street, W.1.

PECKHAM.—Library, Hill Street, for Camberwell B.C.; borough surveyor.

Luton. — Houses (60), Ramridge estate; borough engineer.

Macclesfield.—Houses (121); borough engineer.

Manchester. Extension to sheet metal works at Croft Street, Clayton, for R. W. Morrison, Ltd.; Matley, Brotherton & Mills, architects, 39, Oxford Road, Manchester.

Middlesbrough.—Houses (68), at Berwick Hills. Builders: C. W. Athey, Windsor Road, Middlesbrough (34) and Greenwell & Sons, Albert Road, Middlesbrough (34).

Northampton. — New outpatients' department at General Hospital (£180,000); W. F. Howard, architect, 110, Old Brompton Road, London, S.W.7.

Northumberland.—County primary school at Stobhill Gate, Morpeth for the C.C.; county architect, County Hall, Newcastle-on-Tyne.

Peterborough.—First portion of new police station in Bridge Street; City Engineer's Department, Town Hall.

Portsmouth.—Factory extensions; Hampshire Metal Finishers, Fratton Industrial Estate.

Princes Risborough.—Houses (42), Perryfields, for Wycombe R.D.C.; J. M. Smith, architect, High Street, High Wycombe.

Rawtenstall.—Houses (25), Lomas Lane estate, and 18 at Staghills estate; Rossendale & District Building Trade Employers' Association, 33, Haslingden Road, Rawtenstall.

Reigate.—Houses (63), Rushetts Farm estate; borough surveyor, Town Hall.

Seaham.—Houses (36), Westlea estate, for the U.D.C.; Tomlin & Son, Ltd., builders, South Crescent, Seaham.

Sheffield.—Factory at Boston Street, for H. Brooksbank (Sheffield), Ltd.; Raine & Stacey, architects, 65, Wolstenholm Road, Sheffield.

Houses for T.C.: Basegreen (20); H. R. Smith (Contractors), Ltd. Birley (42); W. Memmory & Sons, Ltd.

South Shields.—Extensions to Boys' High School for the E.C.; Cairns & Byles, electrical consultants, "The Cedars," Osborne Road, Newcastle-on-Tyne.

Houses (154) in Auckland Avenue, Marsden Road and Lincoln Road; borough engineer, Town Hall.

Spennymoor.—Houses (50), Kirk Merrington; U.D.C. surveyor.

Stretford.—Dwellings (122), Stretford Road; borough engineer.

Sunderland.—X-ray department at the Havelock Hospital; chief architect, Newcastle Hospital Board, "Dunira," Osborne Road, Newcastle.

R.C. church and presbytery, Farringdon estate; J. W. Taylor & Son, architects, Gallowgate, Newcastle-on-Tyne.

Sutton-in-Ashfield.—Houses (51), Carsic Lane; Warner & Dean, architects to U.D.C., Mansfield Road, Sutton-in-Ashfield.

Swanscombe (Kent). — Five blocks of maisonnettes, Galley Hill Road; Wisking & Gillespie, Ltd., 7, St. James's Road, Gravesend.

Swansea. — Natural science building for University College, Singleton; Sir Percy Thomas, architect, 10, Cathedral Road, Cardiff.

Walsall.—Factory, Wisemore, for T. Homer & Son, Ltd.; Sanders & Proffit, architects, 145, Lichfield Street, Walsall.

Two blocks of three-storey flats (24 dwellings), junction of Persehouse Street and Holtshill Lane; M. E. Habershon, borough engineer, Council House.